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June, 1983

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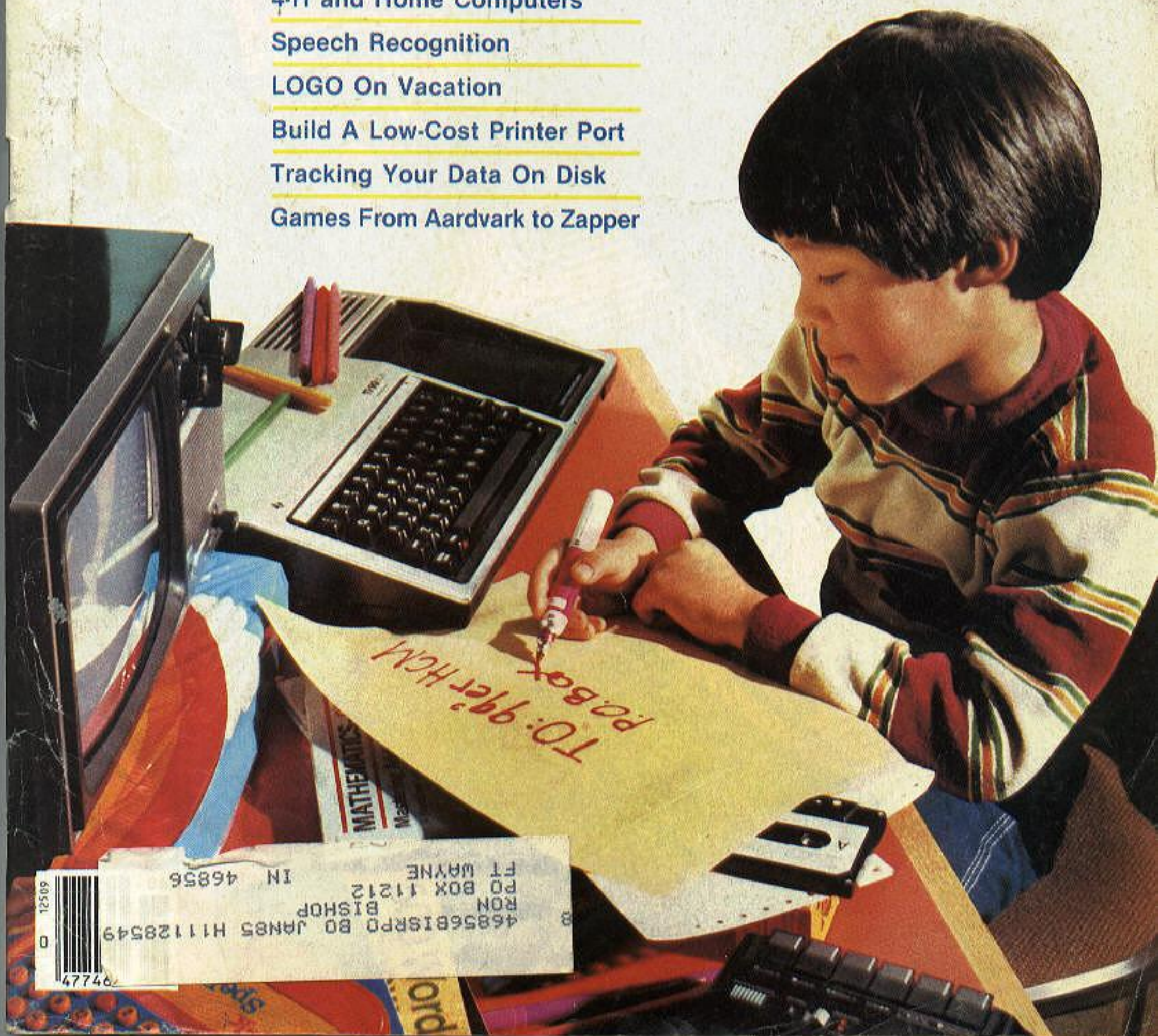
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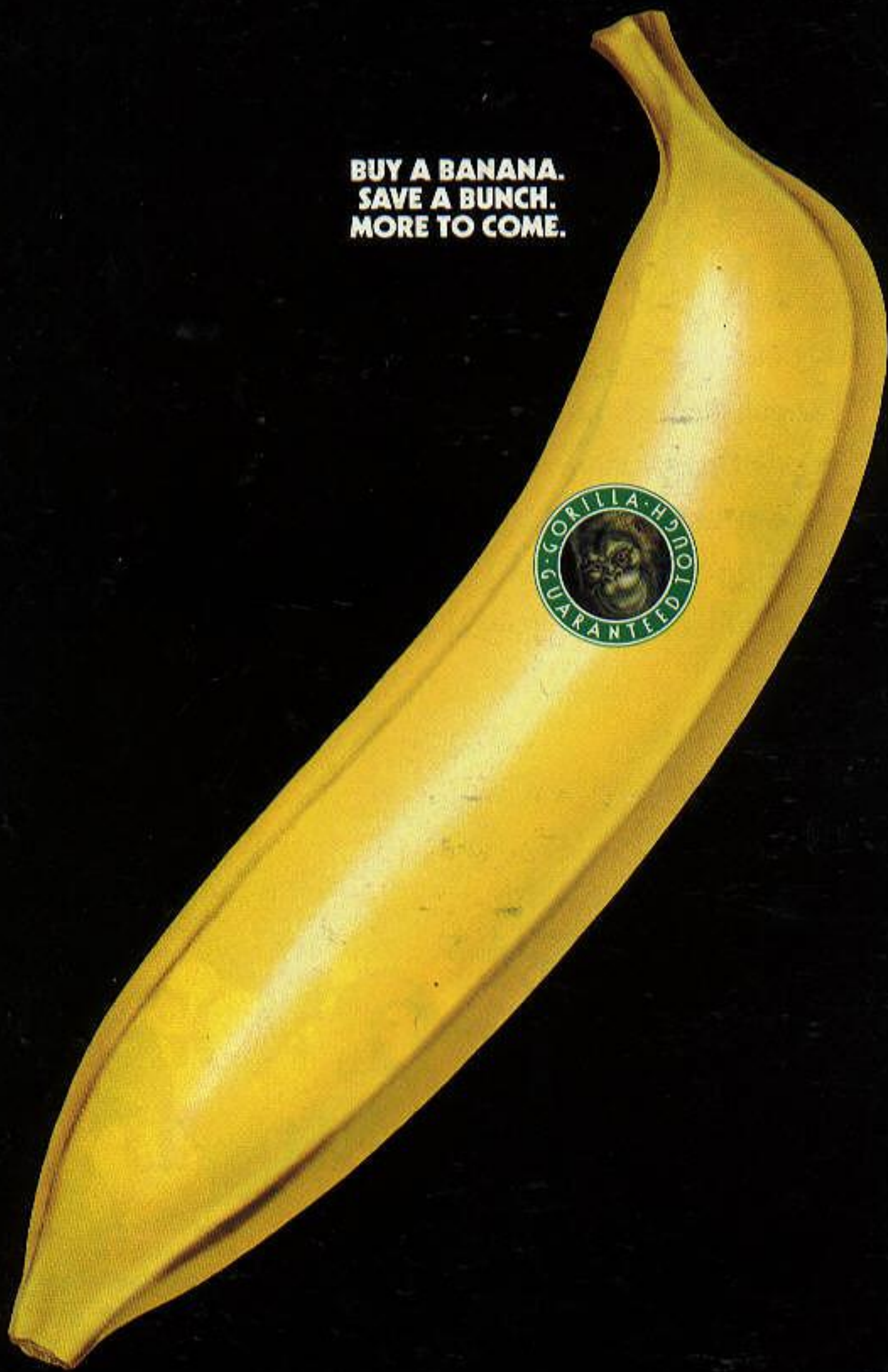


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ON SCREEN

By Gary M. Kaplan
Publisher & Editor-in-Chief



“In North America, *99'er Home Computer Magazine* has been a catalyst for market acceptance of the TI machine and has spawned a rapidly expanding third-party product industry. For TI's *world* markets, we are going to do the same thing.”

Recently, I had an opportunity to visit some of our fellow 99'ers in Europe. The occasion for my trans-polar trip was the Hanover Trade Fair in Germany—a mammoth, annual exhibition of the industrial world's machinery and electrical goods that draws over 600,000 attendees from around the globe.

My reasons for attending the Fair were two-fold: First, I wanted to see all the progress in computers and peripherals from America and Europe. Of this, there was not much new of significance to the world of home computing—only some new display and printing technologies. With a little help from price reductions, which usually accompany the mass-production environment of consumer electronics, they should find ready applications in low-cost home computer systems. I'll be going into this in more detail in forthcoming issues.

Nevertheless, home computing was represented. The “Big Four” manufacturers of home computers in the U.S. were out there pitching their wares to the world's buyers and the consumer electronics press. The Texas Instruments exhibit did not have the grandeur of its typical CES production. (See the February, 1983 issue.) What it lacked in size, however, it made up for in sheer numbers of visitors. The only new product shown that has yet to be introduced in the U.S. was in the calculator field—the low-cost (about \$70 in the U.S.) TI-66, a programmable calculator for the advanced engineering student or professional who needs sophisticated keystroke programming capabilities. It's designed to be used with the companion PC-200 battery-operated thermal printer (\$70 in the U.S.). It's really quite an impressive little package and should give Hewlett-Packard a run for its money.

My second reason for making the trip was to observe first-hand the European micro-computer situation in preparation for launching international editions of this magazine. North American readers might well ask, “What's in it [foreign language editions] for us?” A fair question. Let me answer by describing two inevitable results of this expansion:

First is the strengthening of TI's market position against its tough European competition. In North America, *99'er Home Computer Magazine* has been a catalyst for market acceptance of the TI machine and has spawned a rapidly expanding third-party product industry. For TI's *world* markets, we are going to do the same thing. American manufacturers of home computers are realizing now that they must design and market for *world* consumption. Why? If they are to stay ahead of competition, manufacturers *must* sell huge quantities of machines fast enough to drive costs down. This economy of scale will provide you with better products at significantly lower prices. And we shouldn't forget third-party products either. Our marketing plans call for assisting our advertisers with the necessary conversions, translations, and distribution of their materials for *world* consumption. This too, means that TI users back home will benefit from better, more varied and value-packed products. Our loyal advertisers have supported us; now it's our turn to help them multiply their sales. We all benefit.

The second situation arising from our international expansion (first to Europe, then to other principal TI world markets) is the “cross-pollination” of ideas. Think how many more valuable ideas and programs we'll have because vast numbers of the world's talented people can speak to our international Home Computer community. As *99'er HCM* translates and disseminates its own brand of compu-prestidigitation among the different language editions, once again, everyone will benefit. Incidentally, if any of our international friends would like to help, we welcome articles, news, and programs. Also, suitably skilled individuals interested in employment with us in our foreign offices are invited to contact me.

Since returning home to Eugene, Oregon, I have been asked many times to describe the European home computer market. Quite truthfully, it's not an easy task because I didn't find a “European market,” but rather a *German* market, *French* market, *British* market, etc. Even within one country, the “market” is often fragmented. This makes it difficult for American firms to sell products over there; it takes quite a bit of local expertise.

I can relate one finding that appeared to transcend geographic boundaries. Expensive ROM-based cartridges don't sell very well in Europe. The much lower-priced cassette medium has taken a stronger toe-hold among software producers for the dozens of home computers. And floppy disk systems are still very expensive all over Europe, so disk-based software doesn't fare very well either. The “lowly” cassette seems to be the universal medium. In North America, a sub-\$100 entry fee into home computing is creating a new consumer base. Whether the expansion of the cartridge market will suffer remains to be seen.

In our next issue, we'll report to you on the Summer Consumer Electronics Show in Chicago where TI unveils its new offerings. For a preview of what's coming, my editors suggest that you check out our *99'er Digest* in this issue.



99'er HOME COMPUTER magazine

A young programmer's moment of truth is captured in this month's cover. After hours of running programs, poring over manuals, planning, designing and debugging, he is ready to share his first effort with his fellow 99'ers. His program, like those of the young programmers on the following pages, will probably more than measure up to those of his adult counterparts in technique and imagination. Having already discovered the joys of programming, this neophyte software engineer may soon experience the delight of sharing his creation with other Home Computer enthusiasts, young and old.

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INSIDE

99'er

School's out! And for many of our young people, June is Freedom Month! This issue of *99'er Home Computer Magazine* is fondly dedicated to our children, who will finally have time to do exactly what they want! How will all these creative young minds spend their three-month hiatus from school? Many will play in the sun by day and sequester themselves in front of their computers by night, seeking the solutions to more and more difficult programming problems. Judging by the many imaginative ideas we receive daily, a growing number of children are already expending lots of creative energy at their computer consoles. The samples we publish this month tell us that programming isn't just for grownups anymore. So maybe you should look in the "computer room" the next time you're trying to track down the kids.

Keeping track of our children and their computers may not be so easy this summer—they are meeting in the strangest places these days! In *The 99/4H Connection*, we find them among the horses, cows and pigs learning to program. And that's not all—they are also helping prepare manuals for computer training programs for future generations.

Take a peek with us into the not-so-distant future in two compelling reprints from TI Data System News. The exciting news, according to *Voice Technology*, is that TI has turned a mild-mannered computer into a superphone that dials, talks, and even takes messages for you! The second reprint, *Natural Language Technology Advances*, unveils the use of one of the computer industry's first natural language interfaces. Now TI Professional Computer users can select English words to ask questions of a data base or give commands for a specific task. These advances paint a bright picture of the applications in store for Home Computer users!

Our portrait of *Multiplan* is sketched out in greater detail for this month's *Multiplan Medium*. Our mystic mentor divulges her secrets for using worksheets as communication links with *Multiplan*. After reading this article, nothing will prevent you from diving right into the powerful calculating capabilities of this software. Then take a deep dive into your disk drive and its filing capabilities in *Drive for Diskettes—Part 2*. By the end of this article, concepts like internal and display storage, sequential and relative files, tracks and sectors will seem like old friends.

An old friend of ours has been busy making new friends with elementary students in Lompoc, California. In *Our Pal, LOGO Turtle*, a third grade teacher shares her ideas about how to teach youngsters to program in LOGO. Then two LOGO tutors who work with her class share their vacation with us via their colorful, animated program.

Before we leave school, we'll drop by and check out *Eight Easy Pieces* to see how this package of learning programs designed for special learners fulfills their unique educational needs.

After school's out, how about *Touring Compact Computer Country*? Explore with us how to calculate loan schedules on the CC-40, using our short program to make big decisions easier.

While you are thinking about money, perhaps we can help you save some. If you are electronically inclined, *JoyTalk is Cheap* will help you construct some inexpensive hardware that allows you to use the joystick port of the TI-99/4A to send text humming rhythmically into your printer.

Although we can't guarantee that this humming will be music to your ears, we do offer some melodic insurance in *TI Tuning Fork*. This BASIC program will help you keep your guitar in tune. Perhaps you will find that the sound of data printing and a well-tuned guitar can blend in perfect harmony!

Alas, you will not find ants and anteaters living in perfect harmony in *Aardvark*. This Extended BASIC game, sent to us by a young programmer, lets you play the role of an industrious ant. You, along with the rest of your colony, try to outwit a relentless aardvark in an endless struggle for food. A constant battle also rages in *Space Zapper*. This game, also by a young programmer, will test your intuition and reflexes. Can you ward off alien attackers who are determined to reduce your shield power to nothing?

Summertime may be a do-nothing time for some, but it offers hours of uninterrupted time for many young child programmer prodigies. We are eagerly awaiting the submissions that are bound to come in between now and the time school starts again. The articles, programs and even the *99'er Hall of Fame* in this issue illustrate the imaginative energy that young people bring to home computing. The future of computers is in good hands—small ones for now—but good hands nevertheless.

Until next month, have fun reading, learning and RUNing

LETTERS TO THE EDITOR

Dear Sir:

In a recent article [May, 1983] in your magazine, you discussed word processors. Some of your readers may hesitate to invest in disk drives and other equipment over and above the costs of the printer itself, upon the suspicion that a word processor might be very handy to have. Some might be deterred by the multitude of special keys and functions (pagination, transliteration, etc.) that they find included in full feature word processors. An intermediate step might be a good way for them to evaluate their needs and gain some working knowledge.

We have been producing a simple (12 special functions), straight-forward word processor for quite some time now. It is called TYPWRITER. The responses we receive from users bring a considerable amount of satisfaction that it is a wholly worthwhile and desirable program. We guarantee satisfaction or a full refund (and we have VERY few returned).

TYPWRITER has been periodically revised and updated to include as many features and conveniences as allowed by Extended BASIC. It can be modified by a user (with some programming knowledge) if that is desirable. In fact, we provide information to users as new equipment becomes available (such as the new 128K memory expansion card). And we have an up-date service in the case of major revisions.

TYPWRITER comes on cassette or disk and can be used with the free-standing parallel and serial peripherals currently being advertised in your magazine, as well as the expansion box and related cards. It is easily modified to make use of the various memory expansion units. A copy is provided with this letter so you will be able to see that it has these and many other features.

Jim Schwaller
Extended Software Company
Cincinnati, OH 45240

Thanks, Jim, for the opportunity to review your word processing software. (For those readers not familiar with TYPWRITER from Extended Software, it originally appeared on the market as TI-PWRITER and was one of the very first offered for the Home Computer.) Now that we have your program and user booklet in hand, readers can expect a review of TYPWRITER in an upcoming issue.

Our readers have come up with solutions to a question by Charles C. Foster posed in this column (Nov., 82). He wanted to know "how to get sprites to leave a trail." Herewith two solutions in Extended BASIC, Charles:

Dear Sir:

I am what one might call a cautious buyer. After comparing the TI-99 4A with other personal computers on the market, I was convinced that it offered the best programming features and versatility. Now, after four months of BASIC and Extended BASIC programming, I am still convinced.

What impressed me most was the graceful motion achieved by the use of sprites. I soon realized that if this motion could be mapped on the screen, intricate patterns could be drawn. However, I was limited by the low resolution of the 24 x 32 spacing of characters. This results in only 768 positions and choppy, discontinuous lines. In order to use the possible 49,408 pixels on the screen, I thought I would need Assembly Language to "poke" these positions.

However, I worked around this problem in the following way. First, I divided the character space into a 64-pixel grid and assigned a character to each pixel. This was done by assigning each position an array coordinate and a corresponding ASCII number. Once this is done, the position of a sprite can be taken. The row and column of the point can be found from the integer value of the sprite coordinates divided by 8. The remainder decides where on that 64-pixel space the point should be placed.

The result is high resolution line drawing with minimal expenditure of memory and no need for Assembly Language.

The example given in the following program maps the trajectory of a bouncing ball. One recommended set of inputs is 28, 2 and .8 for the vertical velocity, horizontal velocity and damping factor, respectively. Other graphic applications are numerous. For instance, detailed sine curves can be drawn even from console BASIC.

Mark Hom
Bethesda, MD 20814

```
100 CALL CLEAR :: CALL CHAR(97,"3C
7EFFFFFFFF7E3C")
110 DISPLAY AT(3,10):""BOUNCE!""
120 DISPLAY AT(10,3):"VERTICAL VEL
OCITY:"
130 DISPLAY AT(12,3):"HORIZONTAL S
PEED:"
```

```
140 DISPLAY AT(14,3):"DAMPING FACT
OR:"
150 ACCEPT AT(10,22)BEEP:P :: ACCE
PT AT(12,21)BEEP:SF :: ACCEPT
AT(14,19)BEEP:DAMP
160 RANDOMIZE :: FOR T=1 TO 12 ::
CALL COLOR(T,INT(RND*13)+3,1):
: NEXT T :: CALL SPRITE(#1,97,
16,158,16,0,0)
170 CALL CLEAR :: DIM D(8,8):: A=3
2 :: B,F=0
180 FOR Y=0 TO 7 :: FOR X=0 TO 7 :
: A=A+1 :: D(Y,X)=A :: NEXT X
: NEXT Y :: A=32
190 FOR W=3 TO 0 STEP -1 :: A=A+1
: CALL CHAR(A,RPT$("0",B)&STR
$(2^W)):: NEXT W :: B=B+1 :: I
F B<16 THEN 190
200 FOR U=30 TO 0 STEP 2 :: CALL S
OUND(-200,220+7*U,U):: NEXT U
210 P=P*DAMP :: IF P<2 THEN 290
220 FOR Z=-P TO P :: CALL MOTION(#
1,Z,SP)
230 CALL POSITION(#1,R,C):: R1=INT
(R/8):: C1=INT(C/8)
240 Y=8*(R/8-R1):: X=8*(C/8-C1)
250 IF C1>31 THEN CALL LOCATE(#1,R
,B):: GOTO 230
260 CALL HCHAR(R1+1,C1+1,D(Y,X))
270 NEXT Z :: F=F+2 :: IF F>28 THE
N F=28
280 CALL SOUND(2,220,F):: GOTO 210
290 CALL MOTION(#1,0,SP)
300 FOR A1=1 TO 9 :: CALL COLOR(A1
,INT(RND*13)+3,1):: CALL KEY(0
,K,ST):: IF ST THEN CALL CLEAR
: CALL CHARSET :: GOTO 100
310 NEXT A1 :: GOTO 300
320 END
```

An interesting program, Mark.

The heart of the program—statements 180 and 190—defines the characters left behind as the sprite moves across the screen. The CALL CHAR statement in line 190 recognizes that the values 8, 4, 2, and 1 define one-dot blocks in the CHAR subprogram, and takes advantage of the ability of the CHAR subprogram to fill in character definitions with zeros automatically. (See TI Extended BASIC, p. 57.) Line 240 then determines exactly which of the newly-defined, one-dot characters has its dot closest to the last location of the sprite.

Continued

Entering 99'er Programs

New readers should be aware that within the magazine's pages are found actual computer programs that you can put into your Home Computer and enjoy.

Make sure you have any special system components required by the program (i.e., the Speech Synthesizer, Extended BASIC cartridge, etc.). Then, using the console keyboard, you can type the printed

magazine listing (character for character, and line by line) into the computer's memory.

Before entering the program, connect a cassette recorder to the computer. Make sure you have two blank cassette tapes. For each 10-20 lines you type in, use SAVE CS1 to save that program segment onto one of the tapes. Alternate between the two tapes each time you save the program. Be sure to rewind to the beginning of each

tape before saving, so that you always record over and replace the shorter segment of program lines with the longer segment. By following this procedure, you'll always retain most of your work even if the lights go out or someone turns off the computer.

Double check your typing against the program listing for errors, and then have someone else check it. The most common errors are typing the letter "O" instead of the number "0" (zero)—they are not interchangeable to the computer. This is also true for the letters "I" and "L" and number "1" (one). See "Key-In Reference"

Every time you make a correction to your program, SAVE CS1 and switch the tapes. Once all the errors are corrected, you will have a good copy of the program on the last tape. Before turning off the computer, put the other cassette tape in your recorder and once again SAVE CS1. Now, if one tape gets damaged, you won't have to enter the program listing via the keyboard all over again. Have fun and happy computing.

Programming Conventions

KEY-IN REFERENCE

100 ABCDEFGHIJKLMNOPQRSTUVWXYZ+ (= *%~%\$#@!-/'"?_!C":;3456789

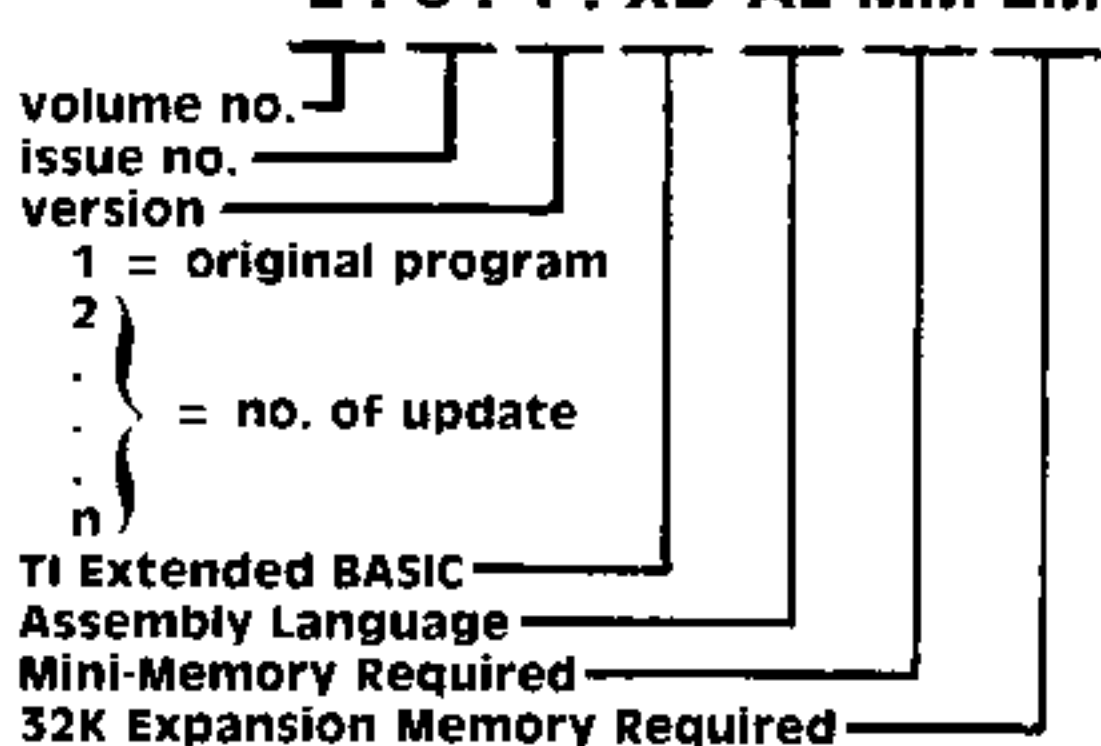
99'er =End of Program or Article

compu-prestidigitation

(kóm-pū-prēš-tēh-dī-jēh-tā-shūn) —n. 1. The magical quality of unexpected comprehension that results from presenting technical information about computers in a lively, entertaining, visually attractive and easy-to-understand format. 2. The magical tricks that make a computer sing, dance, and do all sorts of wonderfully useful things.

99'ER VERSION

2 . 8 . 1 . XB AL MM EM





Group Grapevine: News of TI Users Groups From Around the World.

It's June and users groups are busting out all over! Two new groups have recently joined the ranks of organized TI users. From Alabama, the **Wiregrass 99/4 Home Computer Users Group** sends us their first newsletter. It sounds like this group has big plans. Interested TI-users in southeast Alabama can contact Dr. Roger Crampton, 106 Harwood Place, Enterprise, AL 36330. From the West Coast, Don Veith of **TEX-BUG** (the Bakersfield TI Users Group) writes to inform us that their fledgling group is welcoming new members. Contact him at 3535 So. H St. #93, Bakersfield, CA 93304.

We were also happy to hear from the **TI Users Group in Melbourne, Australia**. Those Aussies really know how to crank out the newsletters—this one was a whopping 45 pages of listings, tutorials and reprints. Interested parties can reach the group's coordinator, Doug Thomas, at 59 Landstrom Quadrant, Kilsyth, Victoria 3137, Australia, Tel. 03-725-8187.

Meanwhile, back in the heartland, the **Mid-America 99 Users Group** is serious about increasing their membership. Potential recruits can write to the group at P. O. Box 2505, Shawnee Mission, KS 66201 or telephone Terry Brown at (913) 268-7199. The **Kansas City Area TI-99/4A Computer Users Group** has sent us their newsletter which includes a short piece on using the Home Computer to teach the various hand positions of American Sign Language, as well as program listings for drawing the letter "O" in sign language. For further information, contact Larry S. Jacobson, 4511 N. Troost, Kansas City, MO 64106.

We are proud to acknowledge a newly formed club right in our own back yard. The **TI Users Group of Eugene** elected officers on May 7th of this year and adopted a club constitution. Officers elected at the meeting were: President, Alex Tingley; Vice President, Bill Streeter; Treasurer, Henry Luvert. The club meets the first Saturday of each month, 9AM-1PM at the Eugene Public Library. Contact the group at TI Users Group of Eugene, 3577 Hawthorne, Eugene, OR 97402.

A speeding wheel is the logo of the **Daytona 99'ers**. They have developed a computerized telephone bulletin board system to answer questions and exchange information among members between meetings. The group can be reached at P. O. Box 4594, S. Daytona, FL 32021.

And finally, we have received our first users group newsletter *en francais*. The **Fichier-99** from the **Montreal-99** group arrived in the mail recently. There was a short piece on *la formule CALL KEY* and mention of the CC-40 as the first of a *nouvelle famille chez Texas* that will be programmable in Enhanced BASIC. The newsletter ends with a cheery *Bonne Programmation!* The group can be contacted at Fichier-99, Rue Sauve Ouest, Montreal, Que. H3L 1Z7 Canada, Tel. 387-1922.

We wish users groups all over the world *bonne chance* this month as they meet to share ideas, problems and solutions. We look forward to hearing from you in any language; TI users share a common dialect after all. So send your letters and newsletters to the Users Group Editor, 99'er Home Computer Magazine, 1500 Valley River Drive, Suite 250, Eugene, OR 97401.

As it stands now, however, any values of vertical velocity (P) and damping factor (DAMP) which give a value of 24 or larger when multiplied together (that is, if $P \cdot DAMP \geq 24$) result in a BAD VALUE message for line 260. One way to avoid this is to screen the input to the CALL CHAR statement in line 260 by inserting line 255, with a value test:

```
255 IF R1>=24 THEN GOTO 270
```

Try this line; you may be surprised by the results.

Other readers will, of course, find other ways to modify sprite motion or value limits in this program to suit their needs.

Dear Sir:

I would like to propose a solution to a problem described by a reader in your November, 1982, issue. The reader was attempting to write a plotting routine in Extended BASIC. He was able to make a sprite follow the shape of a curve and was asking how to leave a "trail" behind the sprite so a plot of the curve would be left on the screen.

I redefined the problem as "How do you put a dot on the screen at a given dot-row and dot-column position?" The enclosed cassette tape contains a subroutine to do this (lines 310-340). Unfortunately you need Extended BASIC to execute this subroutine because BASIC does not allow you to retrieve the hex description of a character. You need to set up two "look-up tables" (variables H\$ and HEX\$) to make the subroutine 310 execute "quickly." Those "look-up tables" are set up once in the program—see subroutine 210 (lines 210-250). The mainline program (lines 100-180) tests the subroutine by allowing you to draw high-resolution shapes on the screen using a joystick. I have applied the same routine for plotting functions of the form $y = F(x)$.

Richard Gibson
Scarborough, Ontario
Canada, M1W 3C4

```
100 REM *****
110 REM
120 REM mainline
130 REM *****
140 GOSUB 180 ! set up data
    for sub310
150 CALL CLEAR :: CALL CHAR(33,"C0
    C0") :: CALL SPRITE(#1,33,16,10
    0,100)
160 CALL JOYST(1,XR,YR)
170 CALL MOTION(#1,-YR*2,XR*2):: C
    ALL MOTION(#1,0,0):: CALL POSI
    TION(#1,DOTR,DOTC):: GOSUB 310
    :: GO TO 160
180 REM *****
190 REM data for sub310
200 REM *****
210 OPTION BASE 1 :: RESTORE :: DI
    M H$(16,4)
220 DATA B,4,2,1,9,5,3,1,A,6,2,3,B
    ,7,3,3,C,4,6,5,D,5,7,5
230 DATA E,6,6,7,F,7,7,7,8,C,A,9,9
    ,D,B,9,A,E,A,B,B,F,B,B
240 DATA C,C,E,D,D,D,F,D,E,E,E,F,F
    ,F,F,F
250 FOR I=1 TO 16 :: FOR J=1 TO 4
    :: READ H$(I,J):: NEXT J :: NE
    XT I :: HEX$="0123456789ABCDEF
    " :: NN=33 :: RETURN
260 REM *****
270 REM put a dot on the
280 REM screen at position
```

```
290 REM "dotr","dotc"
300 REM *****
310 IF NN>142 OR DOTR>192 THEN RET
    URN
320 R=INT(DOTR/8)+1+(INT(DOTR/8)=D
    OTR/8):: C=INT(DOTC/8)+1+(INT(
    DOTC/8)=DOTC/8):: Y=DOTR-R*8+B
    :: X=DOTC-C*8+B
330 CALL GCHAR(R,C,M):: CALL CHARP
    AT(M,M$):: L=2*Y+(X<5):: NN=NN
    -(M=32):: N=M+(M=32)*(M-NN)
340 CALL CHAR(N,SEG$(M$,1,L-1)&H$(
    POS(HEX$,SEG$(M$,L,1),1),X+4*(
    X>4))&SEG$(M$,L+1,16)):: CALL
    HCHAR(R,C,N):: RETURN
```

Also an interesting solution.

In this program, the joysticks define the sprite motion in lines 180 and 190. The second CALL MOTION statement in line 180 freezes the sprite after it moves two pixels; changing the multiplication factor in the first CALL MOTION statement (now 2) will cause the sprite to move by other increments. Of course, other users could define motion in other ways—for instance, mathematically, as Richard suggests—and insert that definition at this point.

The major difference in the two programs is in their character definition methods. Mark defines all the necessary characters in advance and then CALLS the appropriate character when needed; this makes his program run quite fast. Richard creates a look-up table and then defines characters as needed with a subroutine; this makes his program run more slowly. For some applications, one solution might be advantageous; for different applications, the other solution might. We suggest that you try 'em out.

Thanks to Mark and Richard for their effort, and for demonstrating that a programming problem almost never has just one solution.

Dear Sir:

I am writing in regard to your "Tiny Tutorials" column [March, 83, p. 50], which dealt with the AND and OR functions in TI BASIC. Comparing a truth table of a logic OR gate with your OR statement, IF (KEY<0)+(KEY>1)=-1 THEN 370, one does not come up with quite the same results.

		(KEY<0) (KEY<0)	
		OR	+
KEY<0	KEY>1	(KEY>1)	(KEY>1)
T	T	T	-2
T	F	T	-1
F	T	T	-1
F	F	F	0

The statement "IF (KEY<0) + (KEY>1) = -1 THEN ..." satisfies the second and third conditions but not the first; rather, it displays behavior more characteristic of the Exclusive OR. I believe an OR statement should read "IF (KEY<0) + (KEY>1) < > 0 THEN ..."

Congratulations on the quality of your magazine—it's just what we TI'ers desire.

Laurie Kozun
Grand Center, Alberta

Very sharp. You got us on a fine point. Our function is an OR, but you're absolutely right: It is an Exclusive OR (XOR), which is true if A is true or if B is true, but false if both or if neither are true. Your OR statement will work just fine. Ready to teach a course in Boolean algebra, Laurie?

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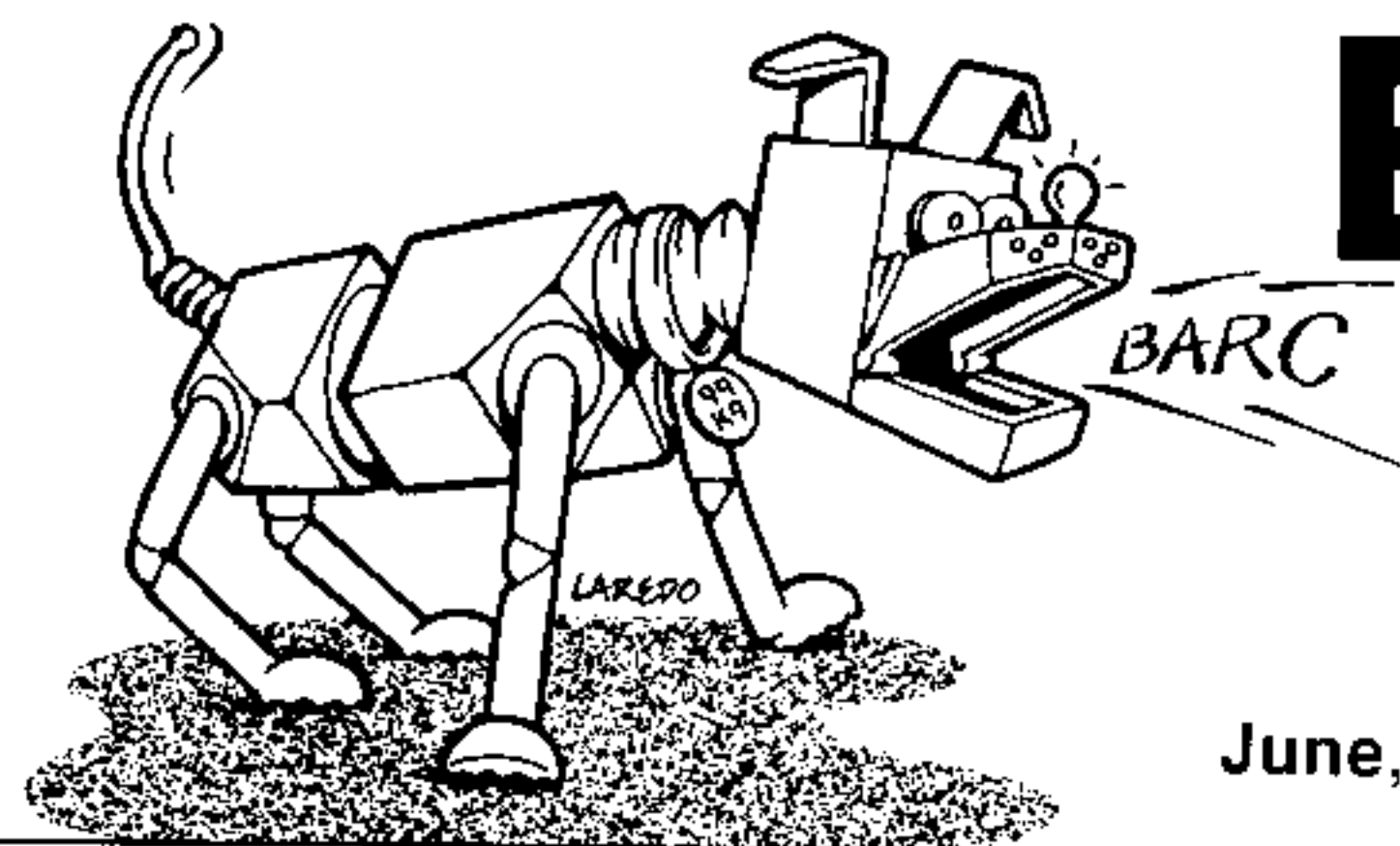
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6. Put a CIRCLE around the above peripheral you are most likely to buy within the next 6 months.
7. Mark all TI language software you own or plan to buy within 6 months. ☐ Extended BASIC ☐ 99/4A Editor/Assembler ☐ UCSD Pascal ☐ LOGO ☐ Forth ☐ Mini Memory ☐ Pilot ☐ CC-40 Editor/Assembler
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Software..... ☐ None ☐ less than \$30 ☐ \$30-50 ☐ \$51-100 ☐ \$101-250 ☐ over \$250
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June, 1983

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99/4H

THE 99/4H CONNECTION:
A 4-H CLUB
AND COMPUTER
PROJECT

By Cathy Gort P. O. Box 101 Lake Stevens, WA 98258

What do horses, pigs, and rabbits have in common with a TI-99/4A? Thousands of kids love them and want to learn about them. Now, with the help of dedicated volunteers, kids in 4-H are learning not only about farming and raising animals, but about computers too!

Vince Rice, Co-op Extension Agent in charge of 4-H programs in Snohomish County, Washington, is developing the country's first teaching and learning manuals for 4-H computer projects. When the manuals are completed, they will be available for 4-H leaders and kids all over the country who want to use computers in traditional farm-related projects—or who just want to learn about computers.

The primary goal of the 4-H club is "to provide training in skills that have a basis in agriculture." But according to Rice, 4-H programs often actually prepare kids to "go out into society and compete with any professional in the field."

This is what he and Ron Figg, a 4-H volunteer who is also a systems analyst at the University of Washington, are hoping to achieve with their new computer project series. They've outlined an eleven-part training program that they will eventually develop into eleven separate manuals. These will provide a complete course in BASIC programming, introductions to all of the other major programming languages, and discussion of topics like compilers and sequential access. Figg sees the series as the equivalent of a two-year data processing course. As Rice puts it, "It's a program with no top end. Kids will be able to go as far as they want with it."

For people accustomed to thinking of the 4-H in terms of horses and rabbits, the computer applications may be hard to imagine. But as our economy has shifted from an agricultural base, 4-H has moved along with it. Their project manuals now cover such topics as electricity and electronics, welding, photography, model rockets, motorcycles, and aerodynamics. And now as the country shifts from an industrial to a technical base, it's not too surprising that 4-H is again shifting along with it—this time to include the new information technology.

Computers and 4-H—Why Not?

Computers and 4-H were officially wed when Rice started talking computers with Figg, whose daughters had been active in 4-H for several years. As a parent volunteer, Figg had already helped his daughters learn about raising rabbits. But his real field of expertise was computers. It was inevitable that he would eventually share this knowledge with them too; as Figg says, "If my daughters can benefit from my knowledge in the field, why not all kids?" Rice, who was always on the lookout for 4-H projects that would appeal to kids in cities (as well as on farms), readily agreed.

With all this enthusiasm and kids who were eager to learn, all they needed to get things rolling were the computers themselves. TI was the natural choice. Figg was familiar with TI's quality, technical support, and selection of software. He used a TI terminal at home for his work. One look at TI's educational software was enough to sell Rice on TI too. After a search of local school districts, they located fourteen TI-99/4A's at the nearby Explorer School and worked out an agreement with the school district to use the computers one night a week for 4-H instruction. Last March, with 10 kids, 14 computers, four adults

and two teen-aged, computer-whiz volunteers to serve as tutors, their first computer project (and a long process of documentation) began.

Computers at School

Although students are exposed to computers in the elementary schools from kindergarten on up, very few children are actually learning programming. In many cases, the computers are used only as a teaching aid. This is because schools must utilize their technology to benefit as many students as possible in the time available. This boils down to minimal individual computer time. Elementary schools in Snohomish County, for example, average fewer than six computers per school, to be shared by hundreds of students.

In a classroom day that is already overcrowded with the three R's, fine arts, lunch and recesses, schools lack not only the

Continued on p. 68



Lou Ann Figg, whose father is a systems analyst for the University of Washington as well as a 4-H leader, has a bit of an edge on the rest of the group when it comes to computing. In the 4-H group she can share her skills with others like Don and Devina, who haven't had as much exposure to computers.



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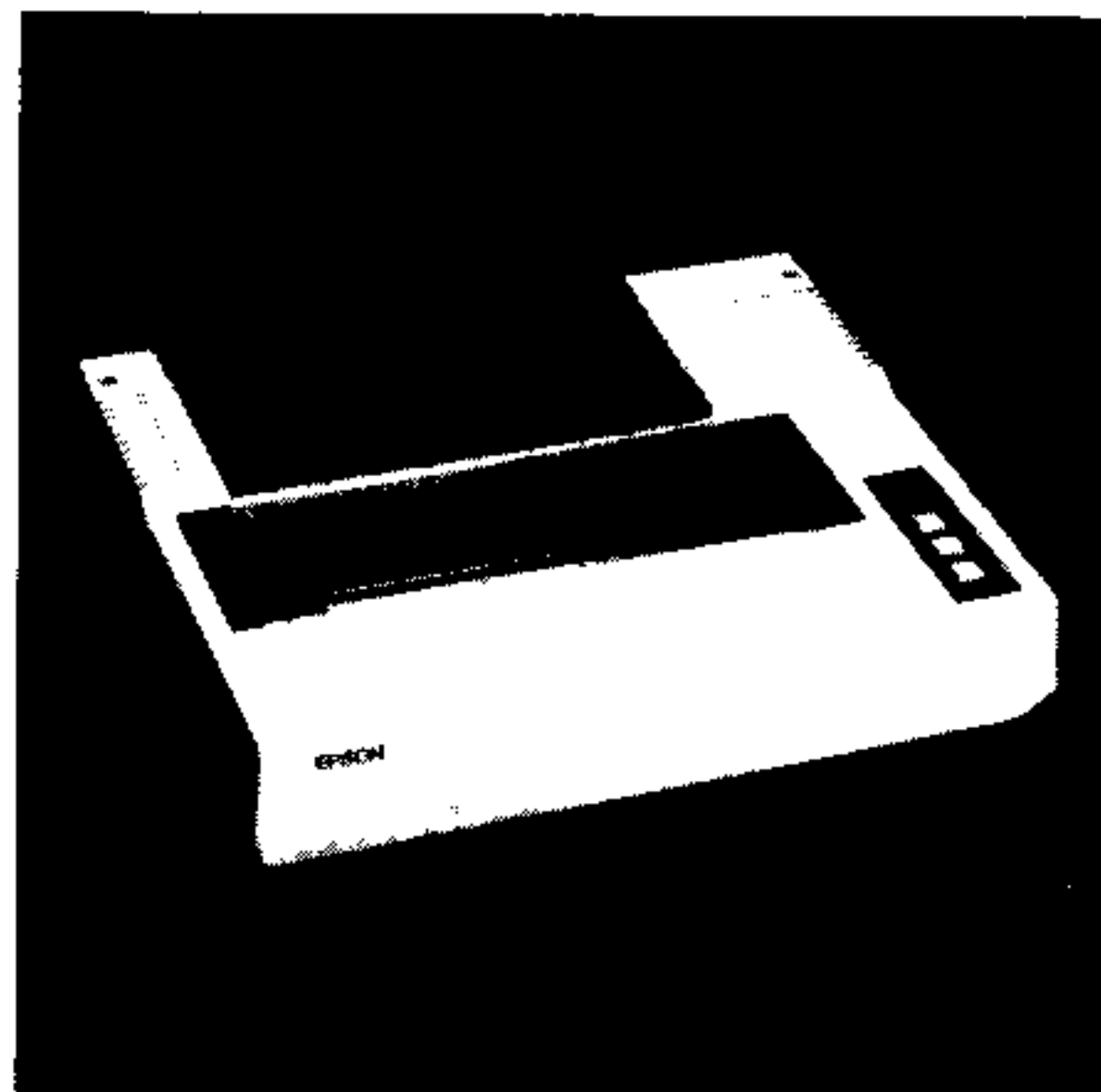
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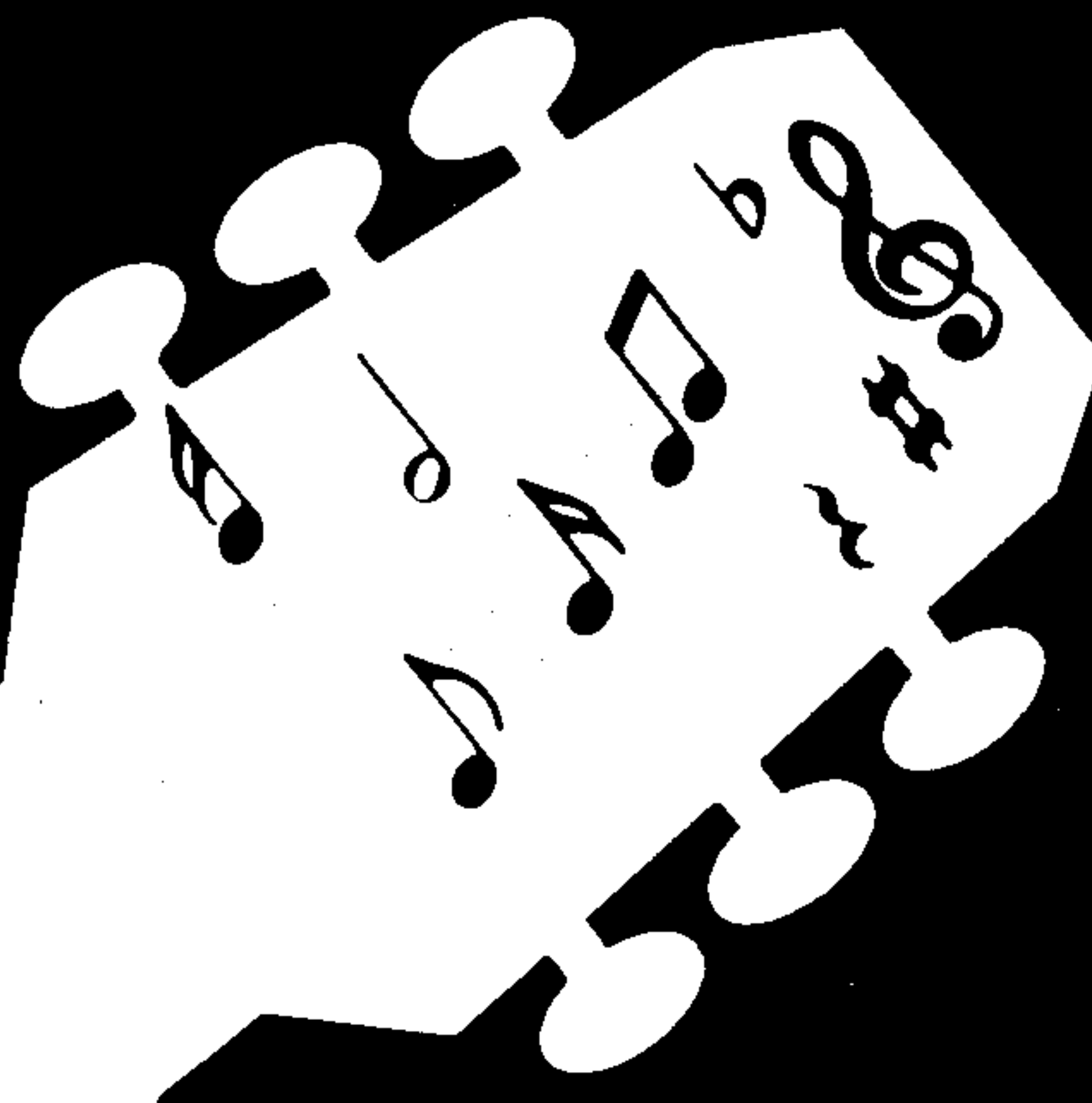
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T1 TUNING FORK



I was one of those hesitant newcomers to computing, someone who never really liked math and tried his best to stay away from anything involving more than a very few numbers. But about seven months ago my wife and I finally agreed that I should learn something about these machines, and the TI-99/4A moved in with us. My job involved operating a computer monitoring system, and I wanted to know more than just how to press the right button at the right time. So I began pressing buttons and learning TI BASIC.

This program started out as an experiment. I was wondering if my limited programming knowledge was sufficient to let me write a useful program. GOSUB statements baffled me, so I tried to incorporate them into the program to see how they work. I thought graphics added a lot of interest to the programs I'd seen, so I figured I'd fit some in. Music has always interested me; I've played the guitar since my teens. So it all added up to a program for tuning the guitar. With a few minor changes, this program can be modified for tuning other string instruments as well. In fact, if you are a more advanced programmer, you can probably adapt these humble beginnings into a program to tune your piano. Once your program is created with the pitches for the notes from middle C to the C above it stored in memory, you can use your own sense of relative pitch to tune the other octaves. Somebody out there could probably even suggest some way to put relative pitch right into the program. For me, however, creating a program to tune my guitar was accomplishment enough.

I designed the guitar graphics to spruce up the title page. A character definition program from a friend was particularly helpful here. A hint from an earlier issue of *99'er* showed me how to combine FOR/NEXT and PRINT statements to scroll the title.

The menu is pretty straightforward. It lists the six guitar strings by number and allows you to choose the one you want to hear. After the choice is entered, a

graphic of the guitar neck appears. You then hear the string tone repeated 20 times (the string you are hearing is highlighted to set it off from the remaining strings). This gives you time to adjust the tension of your string to the computer tone. Do this six times and PRESTO!—you've tuned your guitar.

Graphic Harmony

I worked up a guitar neck graphic and used a GOSUB statement to provide the graphic each time you enter a new string number. The TI manual listed the string frequencies, so that was easy. Another new statement, ON X GOTO, got me from the menu to the particular string on the guitar neck graphic. Color helped me highlight the desired string. This string appeared white on the portable black and white set that I use for programming. Things moved along well until I hooked it all up to our color set to "watch it fly."

It flew like a rock. It seemed that I had defined some guitar string characters with numbers that fell within the sets for the regular letters. This meant that when the program sent you back to the menu, several of the letters were blue while the rest appeared black. Don't get me wrong—I have nothing against blue, but it looks better if all your letters are the same color. Substituting numbers within different sets and adding a FOR/NEXT statement/CALL COLOR combination to return all the letters to black solved this problem.

The same problem appeared with the guitar string colors. Each string had to be defined in a different set so that only one would appear highlighted. A color TV made me feel more "color creative," so I changed the screen color to cyan. Finally, two FOR/NEXT statements gave me the sound of the string with a delay and 20 repetitions.

This isn't a program with a lot of flash. It doesn't dry the dishes while you wash them. In fact, someone will undoubtedly change a few things here and there to clean it up. But you see, that's all right. I wrote the program to prove to myself that

I could do it. Remember, I'm the guy who hates anything involving numbers. The TI-99/4A is a remarkable machine that will provide hours of entertainment to anyone willing to invest the time to get to know it. Now, if I can just save enough money, maybe I'll learn to program in Extended BASIC next!

BASIC

Tune Your Guitar Explanation of the Program

Line Nos.	
100-170	Program header.
180-370	Define graphics characters.
380-500	Display title screen.
510-750	Display options screen and input option.
760-1410	Control loops for the six different strings.
760-860	First string.
870-970	Second string.
980-1080	Third string.
1090-1190	Fourth string.
1200-1300	Fifth string.
1310-1410	Sixth string.
1420-1660	Display graphics.

```

100 REM *****
110 REM * TUNE YOUR *
120 REM * GUITAR *
130 REM *****
140 REM BY JAMES R. NOEL
150 REM 99'ER VERSION 2.8.1
160 REM
170 REM
180 CALL CLEAR
190 CALL SCREEN(8)
200 REM *STRINGS*
210 CALL CHAR(33,"1010101010101010
")
220 CALL CHAR(40,"1010101010101010
")
230 CALL CHAR(56,"1010101010101010
")
240 CALL CHAR(64,"1010101010101010
")
250 CALL CHAR(128,"101010101010101
0")
260 CALL CHAR(136,"101010101010101
0")
270 REM *NUT*
280 CALL CHAR(91,"FFFFFFFFFFFFFFF
")

```

Continued on p.

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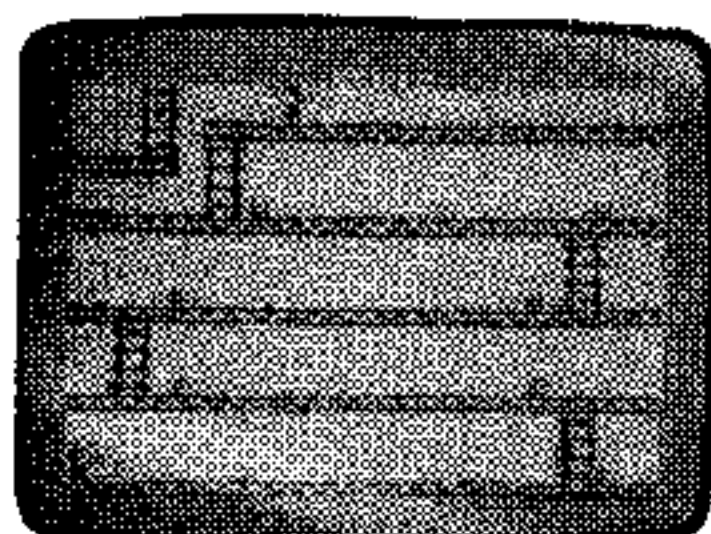
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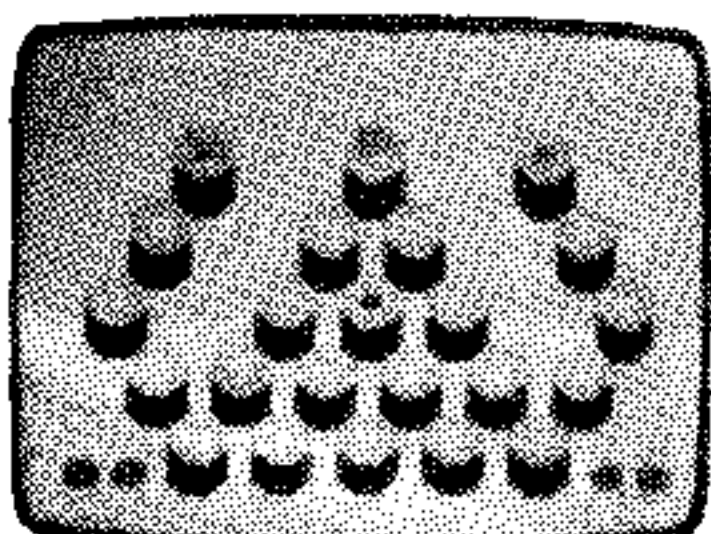
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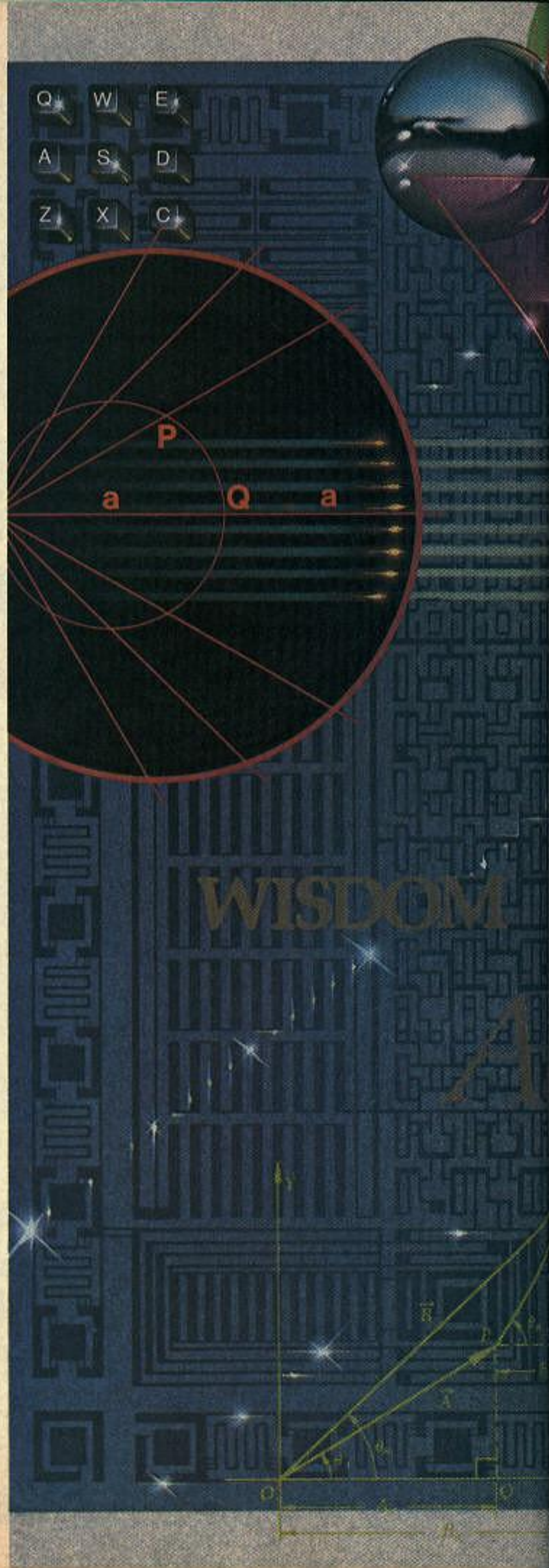
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CHIP SHOT

CHIP SHOT

A Review of Mini-Golf

By Sharyn Lyon

Technical Editor

Name: Mini-Golf
 Author: James W. Behlen
 Program Type: Simulation game
 Language: Extended BASIC
 Distributor: BeeJay Funware
 P. O. Box 27643
 Denver, CO 80227
 Price: \$12.95, cassette or diskette

System Requirements:
 Extended BASIC Cartridge
 Cassette Recorder

	Poor	Fair	Good	Excellent
Performance:	████████████████████			
Engrossment:	████████████████████			
Documentation:	████████████████████			

Wouldn't you know it! All week you've been looking forward to your golf day, and now it's raining. Dam it! Looks like you'll have to forgo your favorite leisure time activity and clean the garage instead. Well, cheer up—BeeJay Funware has come to your rescue with their *Mini-Golf* game. This simulation of the recreational favorite has many of the elements of outdoor golf plus some extra added attractions to keep you saying "Fore!" and asking for more.

As you would expect, the screen display looks something like an outdoor golf course. Each well-trimmed green is complete with sand traps and a cloudless blue sky. But in outdoor golf the distant cup is marked by a teensy flag that you may or may not be able to see from your tee-off point. This video version lets you see the entire hole from a bird's-eye view. The cup (into which you must hit the ball) is clearly visible. Your starting place is indicated on the screen by a small round ball to differentiate it from the cup, which is larger.

The graphics are uncluttered, and the colors pleasing to the eye. If they were any more complicated, the graphics would distract you from your goal: to play the course through and attain the lowest possible score. You may play alone, continually trying to lower your score, or compete against one opponent. We found the 2-player version of the game slow moving. The second player also has a distinct advantage since he can learn from Player 1's miscalculations and successes. In the interest of fair play, therefore, we recommend that when you play several games in succession, you alternate the role of

Computer Gaming is a section for all game lovers—players, designers, and programmers of microcomputer games. Regular features include product reviews, letters to the editor, player strategy, a question and answer forum, a Hall of Fame for high scorers, tutorial articles on game design and programming, plus interviews with professionals in the world of computer gaming.

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Game Review Criteria

Game Performance measures how well the game responds to the player's commands, rates the quality and realism of the graphics and animation, and examines how well the sound effects, music or speech are integrated into the game. It also determines whether the game delivers what is promised in its advertisements.

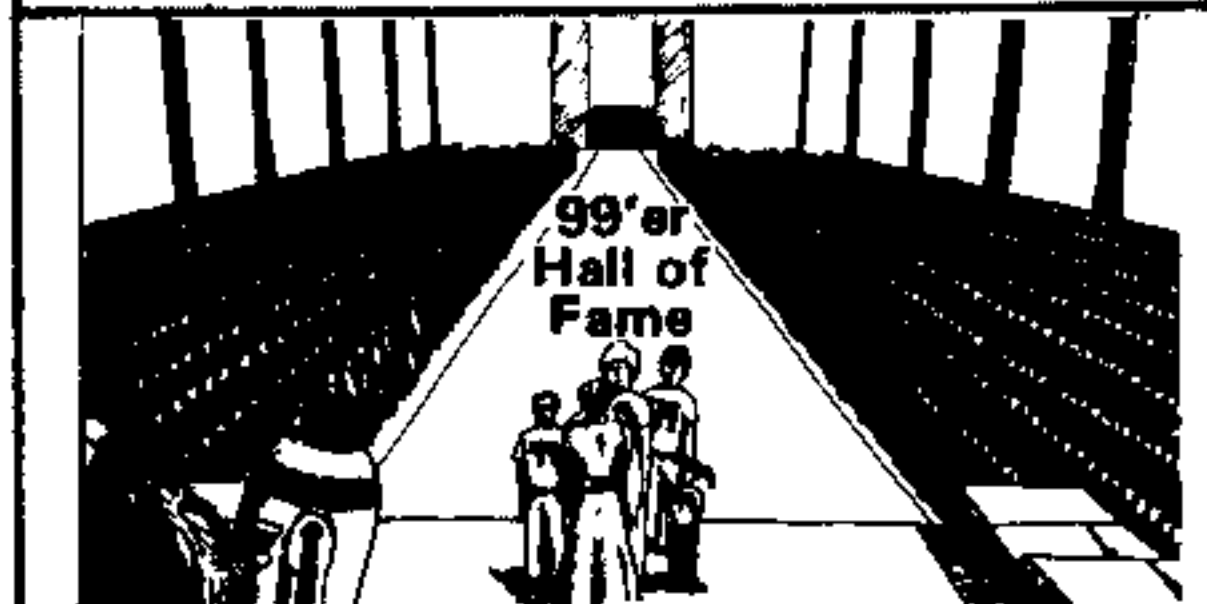
Engrossment focuses on that intangible quality that holds the player on the edge of his seat while the hours tick by unnoticed. The game's staying power is also assessed.

Documentation rates the printed matter that comes with the game. It notes whether the instructions are clear, comprehensive and easy to use, whether the machine configuration requirements are spelled out, and looks for such information as how to load the program, use the keyboard, and restart the game.

Adventure Registry



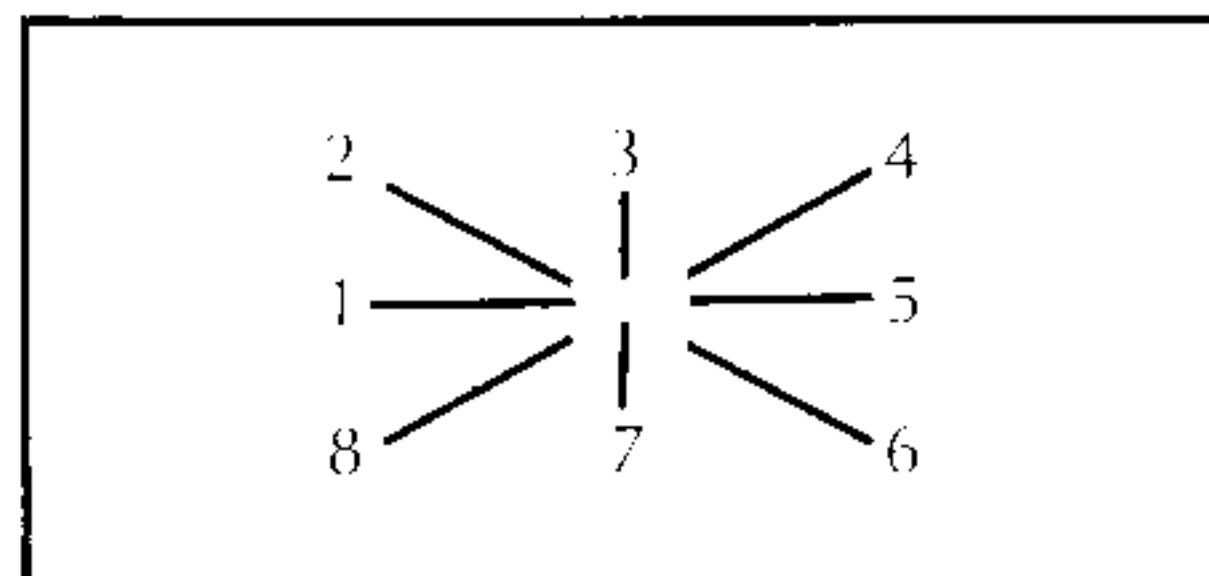
Strategy Corner



Player 1. But for a fast-moving, practice game, it's fun to play alone and play both roles.

Teeing Off

Providing 64 random greens, the 18-hole game asks each player to ENTER the *direction* in which the ball should be hit and the amount of *power* to put into the swing. You use the number keys to communicate these shot specifications to the computer. The power of each stroke ranges from 0 (soft) to 9 (hard), and there are 8 directions in which the ball can be hit (see diagram). Until you have played the game several times, you may want to keep this diagram close to your console.



The game simulates some of the pleasures and challenges of outdoor golf. Rather than using a golf cart, you move from green to green by rolling up the old green and scrolling in the new. And as in real golf, you experience the calming effect of watching the ball float in its trajectory. You are not given the par for each hole, but there is a 9-stroke limit which, if reached, will inspire a low-register "Uh-oh" from the computer.

Par for the Course

Because the 18-hole course is different for each game, you won't be able to replay your favorite course as you can in outdoor golf. This built-in course variation does, however, keep you thinking all the time. Golf is a game that requires strategy, as well as a balance of aim and power. *Mini-Golf's* varied course provides good practice in these essential elements of the game. If you hit the ball in the right direction but with too much or too little force, it will take more "strokes" to reach the cup.

Most of the game is quite realistic, and as you play the course, you can imagine yourself at the Master's Tournament. But your fantasy comes to a halt when you encounter a sand trap. These orange blotches may resemble sand traps, but they actually function more like trees along a fairway. Your ball cannot land in these traps, but it can ricochet off the sides. If you put the sand traps to use in this way (the best technique we found for getting a hole in one, by the way), the game resembles miniature golf or bumper pool more than the big course golf variety.

Fore Score

Along with your view of the hole, the screen displays the score in two ways. It shows each player's stroke count per hole and the subtotal as the game progresses. Looking at the screen display, you can easily tell whose turn it is, how each player is doing, and whether each player im-

proves as the game goes on. In the example below it is ML's turn (as indicated by the 0) to try Hole 5. She is ahead now and has decided to hit her ball in direction 4 with a power of 3.

HOLE	5	DIR	4	PWR	3
PLAYER	ML				
	1 5 2 5 0				1 7
	2 9 6 3				1 8

The screen can display the number of strokes per individual hole for only nine holes at a time, but your cumulative score remains on the screen and reflects your changing total throughout the 18-hole game.

Logging Your Mind

Mini-Golf won't give you any physical exercise, but it will give your mind a good workout. It is not an arcade-type game geared for speed and scores in the thousands. It is a game that calls for precision and a geometrical understanding of how to set up a shot. What makes *Mini-Golf* mentally exciting is that the game doesn't get more sophisticated, *you* do! It is the same as regular golf in that improving your score depends on your judgment of distance and stroke force. The game remains a challenge as you strive to improve your handicap.

If you have a great game going and you make a typing mistake, don't lose heart. There is a built-in error-handling safeguard so that a typing mistake won't ruin your game. After typing in the direction of your shot and deciding that the number you typed is wrong, all you need to do is press FCTN 9 before typing the power number. This erases the mistake so you can start over. Once the power number has been typed in, however, the ball automatically begins to move. The game might be improved if you had an opportunity to fix a power mistake as well as a directional one. Perhaps having to press ENTER when you're ready to hit the ball would allow time to use FCTN 9 to fix power errors.

Mini-golf is a challenge to play, but it is easy to use: You will find all the necessary documentation on the screen. When you have won the round of 18 holes, the computer declares you the winner and prints the number of strokes by which you won. It would have been nice if the sound and graphics capabilities of the TI-99/4A had been utilized more fully with at least a musical fanfare at the end. But even without such elaborate rewards, playing *Mini-Golf* on a rainy day sure beats the old putt-the-ball-into-the-glass-on-the-floor routine. In fact, your console-ation course may become one of your favorite places to play! The price of the tape or diskette is certainly small compared to a country club membership fee or the price of paying a caddy. So, let it rain—you've got it made because you can play *Mini-Golf* on your 99/Fore-A.

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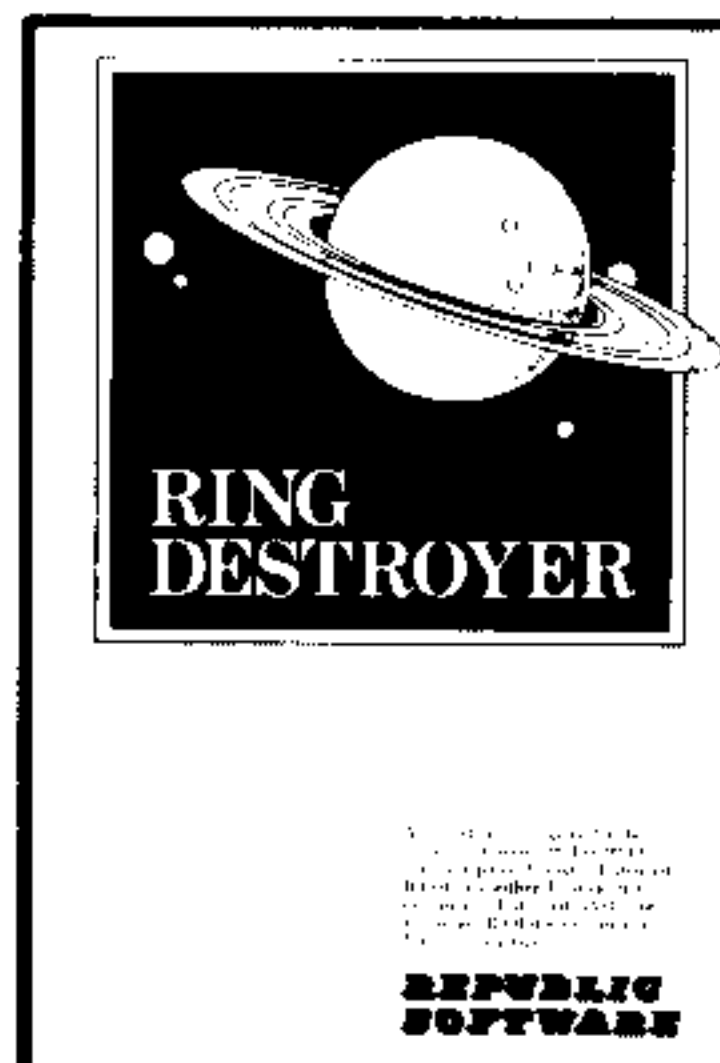
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THE STRAIGHT FLUSH OF VICTORY

A Review of Challenge Poker By Judy Sanoian

Name: Challenge Poker
Program Type: Card game
Language: TI BASIC
Distributor: Pewterware Computer Software
P.O. Box 503
Gulf Breeze, FL 32561
Price: \$10.00

System Requirements: Cassette Recorder

	Poor	Fair	Good	Excellent
Game Performance	████████████████████			
Engrossment	████████████████████			
Documentation	████████████████████			

Another Saturday night alone. What's it gonna be? You could watch that *Love Boat* rerun on TV or leaf through your special "Spring Starlets" issue of *People* magazine. Or maybe you should drive across town and pick up the new Norman Mailer novel everyone is talking about. But you don't feel like leaving the house. You don't even feel like getting dressed. What you really want to do is play a game, but you're sick of Solitaire and you want something more mentally challenging than those "hit-the-button-when-you-see-the-alien" computer games.

Pewterware Computer Software has the solution to the solo game player's blues.

They present *Challenge Poker*, an entertaining combination of Bingo, Poker, Solitaire, and Tic Tac Toe that will challenge (if not frustrate) the most keen intellect. This game may sound easy, but you will soon find out it is anything but.

The screen comes on with a Bingo-style, grid gameboard with P-O-K-E-R across the top and the numbers 1-5 down the left side. The computer presents one card from the deck with each turn and you must place it somewhere on the grid. As with most games, the goal is to amass points; you do it by arranging the cards in horizontal, vertical and diagonal rows of straight flushes, full houses, fours of a kind, straights, threes of a kind, and double pairs.

Strategist's Delight

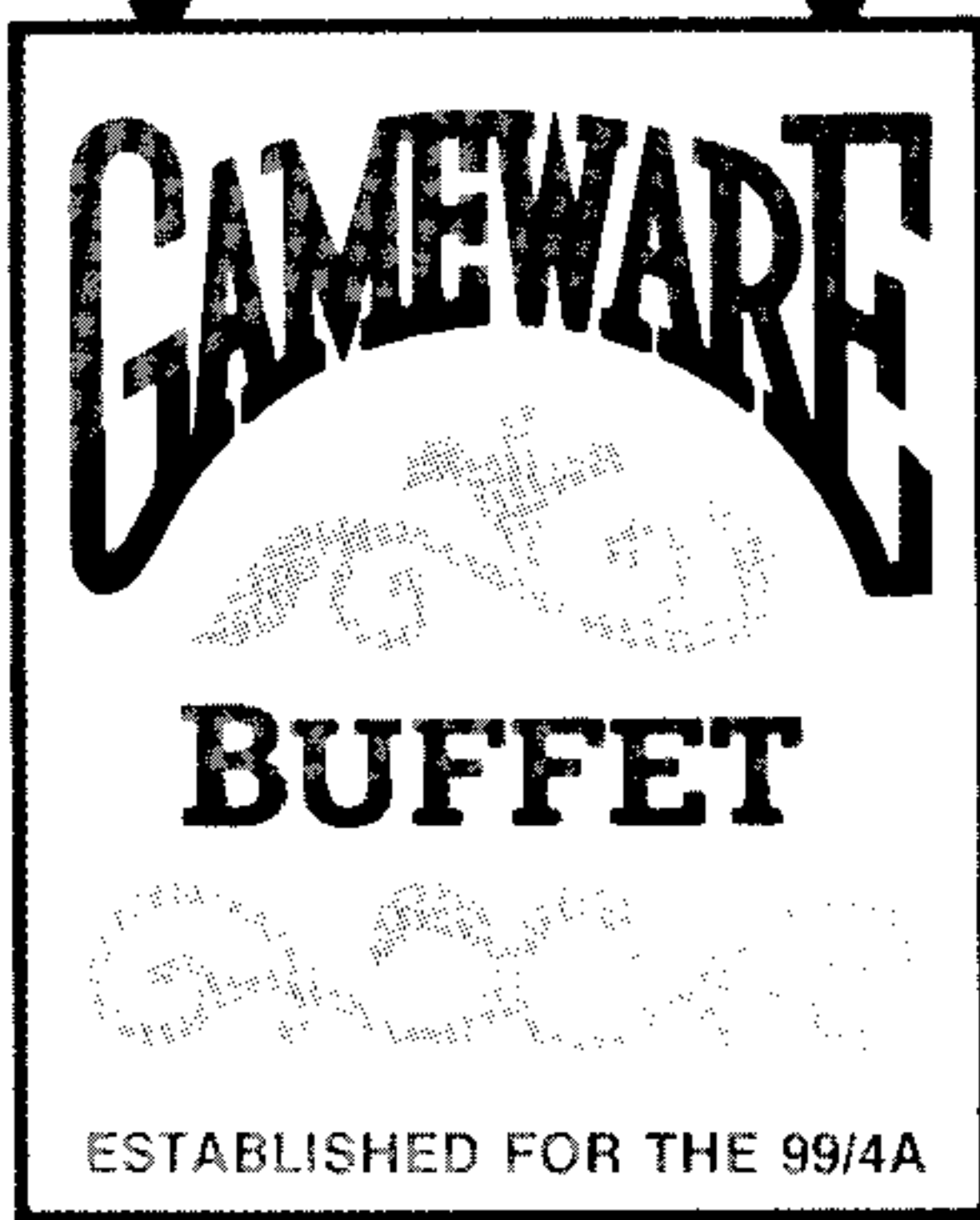
Challenge Poker is, first and foremost, a game of strategy. There are just 25 squares on the grid so you can only count on half the deck being dealt. (As in Bingo, there is a wild card in the center.) You must arrange the cards so that your horizontal row of spades (a potential flush) will intersect to complete the straight you have almost formed on the vertical row to the right. But don't pin all your hopes on getting the king of spades—he may never appear. While the half-deck factor adds to the challenge of the game, it can also prove frustrating for those who want to

engineer elaborate designs. It would be nice to be able to choose a "pass" option so that you could hold out for that one card that will complete the "triple-way, straight flush, full house, four of a kind" you've been carefully plotting.

While *Challenge Poker* can be played with as many as four players, we would advise against it for a couple of reasons. First, because the game is in BASIC, you must wait after each turn for the computer to s-l-o-w-l-y change from your screen to that of your opponent. This was a big yawn with just two people and would be extremely tiresome with three or four. Second, because both players are dealt the same cards (and can see each other's screens), there may be a tendency for the weaker strategist to follow the stronger opponent's game plan. Imitation may be the sincerest form of flattery, but it makes for the duller form of competition.

If you really want to play with an opponent, you can agree not to look at her screen and vice versa. We found, however, that the game is best played as a solitary endeavor. Rather than adding the spark of competition, an opponent turned out to be merely an unwelcome distraction. We had separate game boards, so we weren't really playing against each other, and waiting for her to take her turn (and for the board to change) interfered with concentration and slowed the pace of the

Continued on p. 71

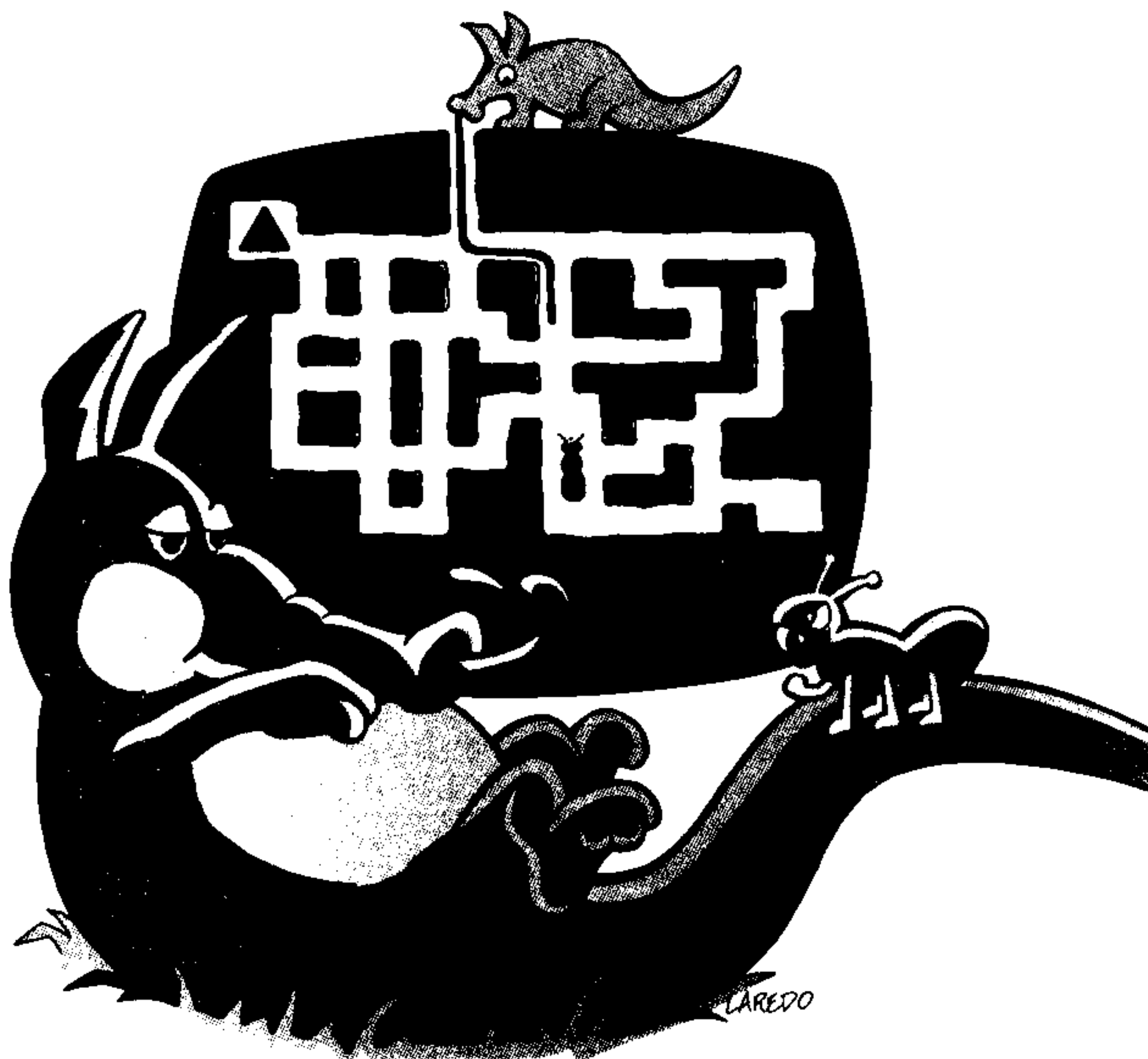


Aardvark

By Patrick Pelletier

12108 Poincaré
Montreal H3H 3M3
P. Q. Canada

An ant's work is never done. What with tunneling all morning and gathering food all afternoon—then tucking the juicy morsels away to be eaten later—it's enough to exhaust anyone. And when night comes to your African grass-land home do you think you can finally relax and have a bite to eat? No! Just as you are ready to mosey up to the storage cell to enjoy your food, a large blue figure casts its shadow over your anthill. Cautiously, you begin to make your way through the labyrinthine tunnels toward your food. Although you cannot see the aardvark lurking at your hill's entrance, your ant sensors can detect the pounding of his huge tail. You can almost feel it as he strikes it on the ground each time he extends his long sticky tongue in search of you and your fellow ants. Quick! Hide under that mound of sand over there! Do it now or he'll give you an aardvarkish lick and have you for dinner! Well, you got by him that time. Just a few more passages and you'll have your own meal. Can you out-turn and out-twist your pursuer's devious extensile tongue? Oh no! There's that tongue again, poking around the corner and sliding right over your head... a close call. Now to go through that last passageway and finally... food! Ha! You've made it! But what about the rest of the hungry ants waiting their turn? The aardvark is smart and fast...



The Name of the Game

Lat before being eaten—that is your goal in this game of survival. Using a joystick, you guide six hungry ants to the food they've set aside. The ravenous aardvark, guided by the computer, will eat the six ants if they don't move quickly and carefully enough. Each time an ant moves, it has about 4 seconds before the eager aardvark comes after him, extending his long tongue down into the maze. If the ant successfully outwits the pursuing anteater and gets to the food, he gobbles up the food to a reward tone. If, on the other hand, the aardvark succeeds in making a meal of the ant, he celebrates with graphically obvious delight as he munches his meal.

This Extended BASIC version of hide-and-seek is fun for even the youngest joystick jockey. Its rules and goals are simple, yet the random movements of the aardvark's menacing tongue make it challenging for older players as well. With six ants to move through the anthill, family members can play together with each player maneuvering one of the ants toward the food, working as a team to outwit the aardvark.

The Score and More

The game ends either when the aardvark is full (having eaten all the ants), or when the ants have eaten all their food. The screen will display the scores for the aardvark and the ants separately, so you can determine which species has survived and which has been eaten up (ants) or starved to death (aardvark).

Aardvark has many endearing features. The screen is entertaining to look at whether you are playing or on the sidelines patiently waiting your turn. The graphics were programmed artistically, with a captivating sense of humor.

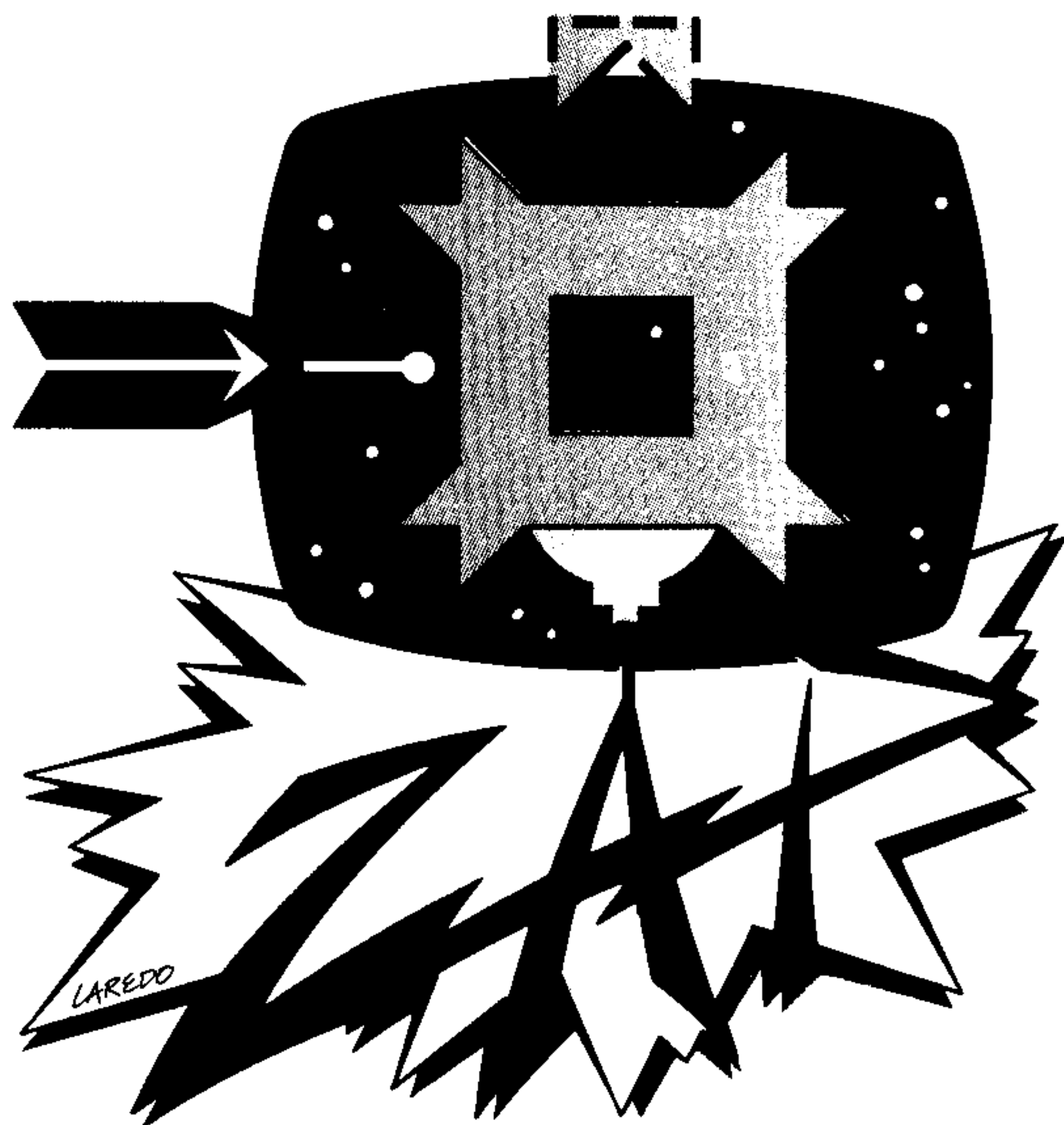
This game could also serve many purposes in a classroom. A teacher might use it as a simple reward for work well done, or as a vocabulary enriching tool in a foreign language class. No, you won't learn to speak like an aardvark, but you may learn to order ants in a French restaurant! This excellent program, sent to us by a twelve-year-old Montreal programmer, displays the instructions and scores in both English and French! A bilingual aardvark in pursuit of bilingual ants. C'est si bon!

EXTENDED BASIC

Aardvark Explanation of the Program

Line Nos.	
100-170	Program header.
180-270	Display instructions.
280-490	Initialize variables, color, and graphic characters.
500-620	Display playing screen.
630-690	Read joystick and branch to subroutines.
700-770	Data for the screen display.
780-1030	Check movement limits.
1040-1070	Move the ant.
1080-1150	Ant eats the food.
1160-1270	Ant gets eaten by the anteater.

Continued on p. 32



Space Zapper

By Sam Scott

10 Julian Street
Carleton Place, ON
Canada K7C 3W3

You are in a lone space station slowly orbiting Mars. Suddenly you are attacked from the left by a green enemy ship. Before you have time to wonder who the enemy is, what his interests might be, or how many of him there are, you are hit from the right, and your shield power begins to weaken.

You hastily press your rotating blue space zapper into action. The enemy continues its laser attack on your station from the left, the right, from above and beneath you. You rapidly move your zapper from position to position to answer each new enemy barrage.

If you can defend yourself by shooting down the enemy's ships before he destroys your shield power, you will survive. If your shield power falls to 1, then your Space Zapper station will explode into smithereens.

Aim and Fire

Your silvery, geometric Space Zapper station dominates center screen. The green enemy ships come at you, one at a time, from the perimeter. Before you fire at them, you must first use the arrow keys

to correctly position your zapper in one of the four directional gun mounts on your craft. When the zapper fires, a beam goes straight to the green enemy ship and annihilates it.

There's no need to calculate altitudes or relative positions in order to make a hit. You simply press the key for the appropriate direction in response to the threat of enemy attack, then hold the key down to fire. Your Space Zapper responds most quickly if you shift direction in 180° increments (east to west, north to south) rather than in 90° moves. But enemy attacks from unexpected positions can force you to go from north or south to east or west.

Any time the enemy scores a hit, your station's shield power diminishes. It can dwindle from a high of 100 to a low of 1, which ends the game. You know it's close to the explosive end when your shield power gets down to 15.

Your falling shield power is displayed in a countdown at the top of the screen. Your enemy hits are reported at the end of the game, after the announcement, "Your Space Zapper has been broken down into its separate molecules."

Zapper's Origins

Thirteen-year-old Sam Scott based this TI BASIC game program on an arcade game, *Space Zap*. The graphics are large, bright, and spare, and the elements of play are simple—shoot or suffer progressive deterioration. The instructions for *Space Zapper* are straightforward, and so is the method of play—there's no problem with

temperamental, imprecise joysticks. High scores grow out of quick responses to unpredictable enemy attacks.

[Note: This game is similar to *Battle Star*, an Extended BASIC game published in the August/September, 1982, issue of *99'er*. *Battle Star* featured a smaller, centrally placed cruiser which had to dispose of both the nuclear missiles and the actual launching ships of the enemy. Unlike *Space Zapper*, in which the player fires at enemy ships by holding the directional arrow down, *Battle Star* requires the player to dispatch first the nuclear missile headed toward the player's cruiser, and then, with a second press of the key, the missile launcher itself. —Ed.]

BASIC

Space Zapper Explanation of the Program

Line Nos.	
100-190	Program header.
200-830	Define graphics characters.
840-990	Display title screen.
1000-1070	Display instructions.
1080-1200	Initialize character colors.
1210-1700	Set up playing screen.
1710-1760	Set up variables for the start of the game.
1770-1860	Control the firing of the space station.
1870-2680	Display graphics for the space station's shots.
2690-2760	Randomly choose which alien ship to appear.
2770-2880	Display alien ships.
2890-2980	Subroutine to control when the aliens fire back.
2990-3260	Graphics to display the aliens firing at the space station.
3270-3340	Display the remaining shield power of the space station.
3350-3690	The space station is destroyed. Display the explosion and the end of game message. Start the game over again.

```

100 REM *****
110 REM * SPACE ZAPPER *
120 REM *
130 REM * BY SAM SCOTT *
140 REM *
150 REM *****
160 REM
170 REM 99'ER VERSION 2.8.1
180 REM
190 REM*** CHARACTER CODES
200 CALL CLEAR
210 OPTION BASE 1
220 DIM A$(158)
230 DATA FF7F3F1F0F070301,0103070F
    1F3F7FFF,80C0E0F0F8FCFEFF,FFFE
    FCF8F0E0C080,FFFFFFFFFFFFFFFF,
    000000000000FFFF
240 DATA FFFF
250 RESTORE 230
260 FOR F=40 TO 44
270 READ A$(F)
280 CALL CHAR(F,A$(F))
290 NEXT F
300 RESTORE 230
310 FOR F=96 TO 102

```

Continued on p. 29

LEARN TO FLY!



REVIEWED IN JAN. 99'er

The Dow-4 Gazelle is a simulation of a 4-place, single-engine, high performance aircraft, which will provide fun and challenge as you learn to fly. A high quality program written by a professional programmer/analyst who is also an experienced instrument-rated pilot, the Gazelle is a real-time simulation which responds rapidly to the controls (within one second on the average).

On your screen you see the instrument panel, which has 10 dials with moving pointers and 11 indicator lights. The plane is flown with the joystick, while the keyboard is used to control power, flaps, fuel, etc.

The manual contains 30 pages of text, a glossary, and seven full page figures. It introduces you to the art of flying and leads you, a step at a time, from novice to professional. Learn to take-off, land, navigate, fly instrument approaches, and more. If you get into trouble, you can freeze the action in case you need time to assess your situation. Sound effects add to realism.

This program pushes the TI-99/4(A) to its limits. For both 99/4 and 99/4A, Does not require anything other than a joystick and cassette recorder.

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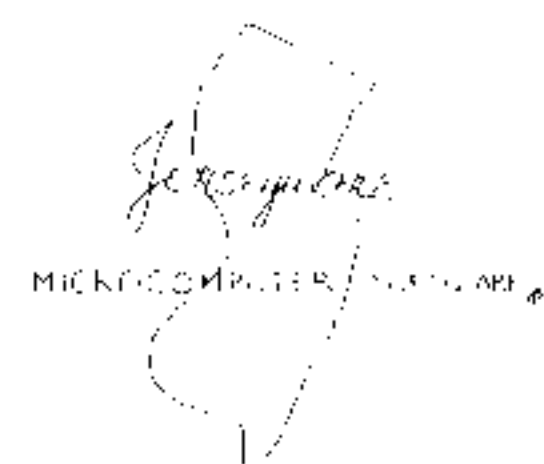
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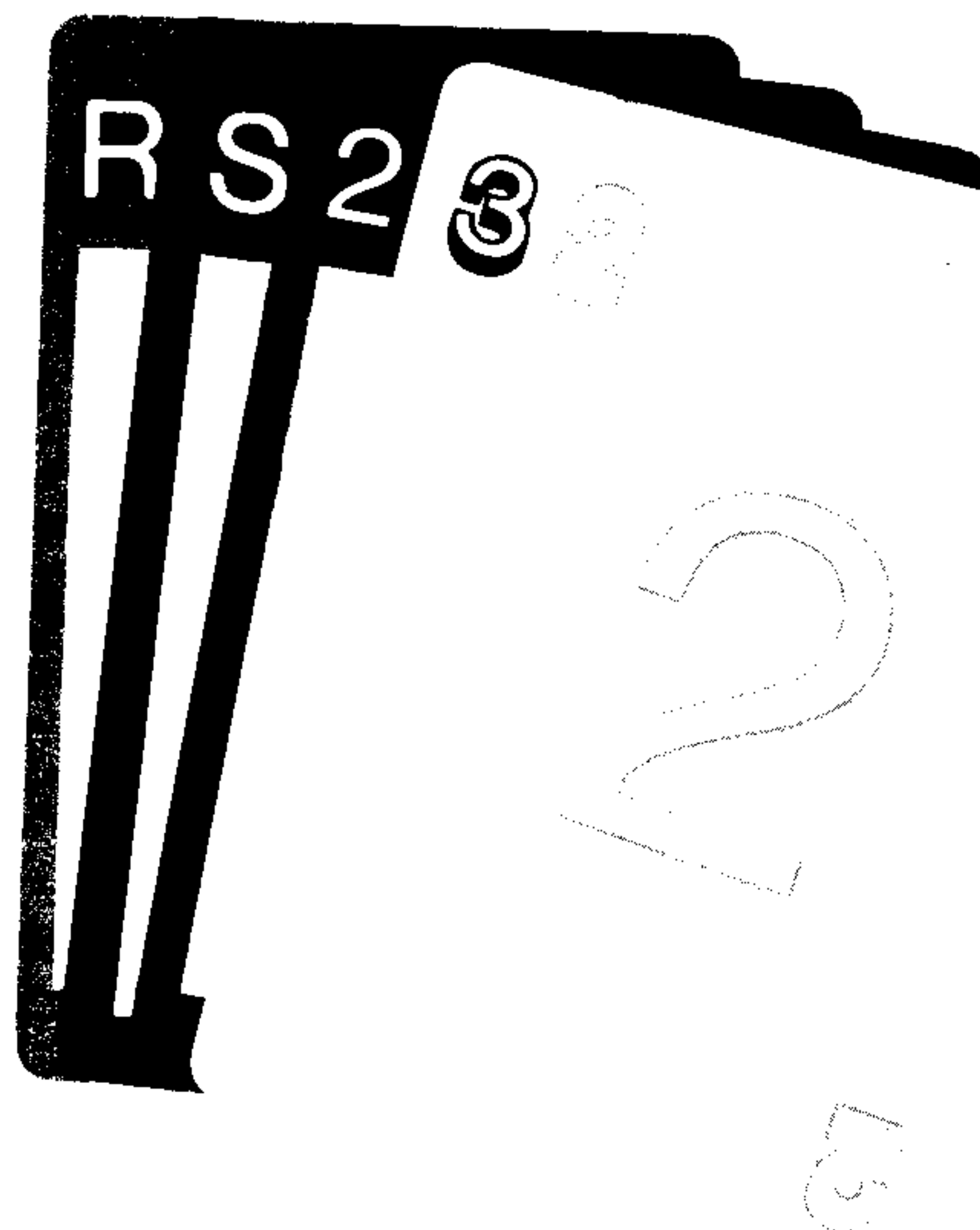
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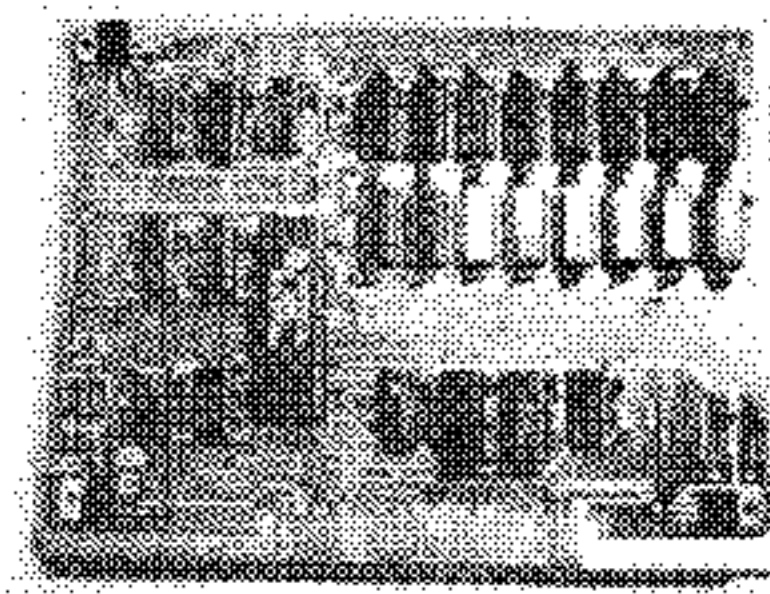
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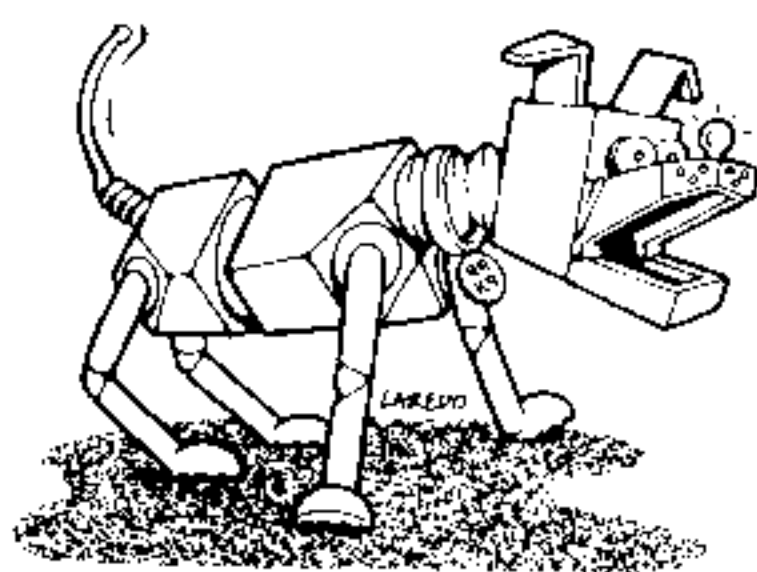


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April's Choice



The people have spoken! The winner of the April B.A.R.C. Back competition is Patricia Swift for her article, *Multiplan Medium: An Introduction to Spreadsheets*. Our hearty congratulations and a \$100 prize go to Ms. Swift.

Zapper ... from p. 25

```
320 READ A$(F)
330 CALL CHAR(F,A$(F))
340 NEXT F
350 RESTORE 230
360 FOR F=112 TO 118
370 READ A$(F)
380 CALL CHAR(F,A$(F))
390 NEXT F
400 DATA 0018183C3C7E7EFF,FF7E7E3C
3C1818,0303030303030303,C0C0C0
C0C0C0C0C0
410 RESTORE 400
420 READ A$(104)
430 CALL CHAR(104,A$(104))
440 READ A$(120)
450 CALL CHAR(120,A$(120))
460 FOR F=105 TO 106
470 READ A$(F)
480 CALL CHAR(F,A$(F))
490 NEXT F
500 FOR F=121 TO 122
510 CALL CHAR(F,A$(F-16))
520 NEXT F
530 CALL CHAR(128,"FFFFFFFFFFFFFFF")
540 CALL CHAR(136,"FFFFFFFFFFFFFFF")
550 CALL CHAR(144,"FFFFFFFFFFFFFFF")
560 CALL CHAR(154,"FFFFFFFFFFFFFFF")
570 CALL CHAR(129,A$(40))
580 CALL CHAR(153,A$(40))
590 CALL CHAR(130,A$(43))
600 CALL CHAR(137,A$(43))
610 CALL CHAR(131,"0F0F0F0F03030303")
620 CALL CHAR(147,"030303030F0F0F0F")
630 CALL CHAR(132,"F0F0F0F0C0C0C0C0")
640 CALL CHAR(148,"C0C0C0C0F0F0F0F0")
650 CALL CHAR(133,"0101010101010101")
660 CALL CHAR(149,"0101010101010101")
670 CALL CHAR(134,"B0B0B0B0B0B0B0B0")
680 CALL CHAR(150,"B0B0B0B0B0B0B0B0")
690 CALL CHAR(152,A$(97))
700 CALL CHAR(145,A$(97))
710 CALL CHAR(138,A$(42))
720 CALL CHAR(146,A$(42))
730 DATA FFFF0F0,00000000F0FFFF,000000000000FF,FF
740 RESTORE 730
750 FOR F=139 TO 142
760 READ A$(F)
770 CALL CHAR(F,A$(F))
780 NEXT F
790 CALL CHAR(157,A$(141))
800 CALL CHAR(158,A$(142))
810 CALL CHAR(155,"FFF0F0F0")
820 CALL CHAR(156,"00000000F0FFFF")
830 CALL CHAR(45,"9942A59999A54299")
840 REM*** TITLE SCREEN
850 CALL SCREEN(2)
860 PRINT "          ": : : : : :
"          , SPACE ZAPPER ,": : : : : :
: : : : : :
870 PRINT "          INSTRUCTIONS? <Y/N>"
880 FOR F=2 TO 8
890 CALL COLOR(F,12,1)
900 NEXT F
910 CALL KEY(0,K,S)
920 IF K=89 THEN 1010
930 IF K=121 THEN 1010
940 IF K=78 THEN 1090
950 IF K=110 THEN 1090
960 CALL COLOR(2,1,1)
970 CALL COLOR(2,12,1)
980 CALL SOUND(100,1000,20)
990 GOTO 910
1000 REM*** INSTRUCTIONS
1010 CALL CLEAR
1020 PRINT TAB(8);"SPACE ZAPPER": :
: : : "YOU MUST DEFEND YOUR SP
ACE ZAPPER STATION ORBITING M
ARS"
1030 PRINT "FROM ENEMY SHIPS WHICH
ARE FIRING FROM ALL DIRECTION
S.": : "WHEN YOUR SHIELD POWER
FALLS"
1040 PRINT "TO 0 STATION SPACE ZAPP
ER": "WILL EXPLODE.": : "USE THE
ARROW KEYS TO AIM AND FIRE
YOUR GUNS."
1050 PRINT :TAB(10);"GOOD LUCK": :T
AB(8);"<HIT ANY KEY>"
1060 CALL KEY(0,K,S)
1070 IF S=0 THEN 1060
1080 REM*** GAME COLOURS
1090 CALL CLEAR
1100 CALL COLOR(2,12,1)
1110 FOR F=3 TO 8
1120 CALL COLOR(F,1,1)
1130 NEXT F
1140 FOR F=9 TO 12
1150 CALL COLOR(F,1,1)
1160 NEXT F
1170 FOR F=13 TO 15
```

```
540 CALL CHAR(136,"FFFFFFFFFFFFFFF")
550 CALL CHAR(144,"FFFFFFFFFFFFFFF")
560 CALL CHAR(154,"FFFFFFFFFFFFFFF")
570 CALL CHAR(129,A$(40))
580 CALL CHAR(153,A$(40))
590 CALL CHAR(130,A$(43))
600 CALL CHAR(137,A$(43))
610 CALL CHAR(131,"0F0F0F0F03030303")
620 CALL CHAR(147,"030303030F0F0F0F")
630 CALL CHAR(132,"F0F0F0F0C0C0C0C0")
640 CALL CHAR(148,"C0C0C0C0F0F0F0F0")
650 CALL CHAR(133,"0101010101010101")
660 CALL CHAR(149,"0101010101010101")
670 CALL CHAR(134,"B0B0B0B0B0B0B0B0")
680 CALL CHAR(150,"B0B0B0B0B0B0B0B0")
690 CALL CHAR(152,A$(97))
700 CALL CHAR(145,A$(97))
710 CALL CHAR(138,A$(42))
720 CALL CHAR(146,A$(42))
730 DATA FFFF0F0,00000000F0FFFF,000000000000FF,FF
740 RESTORE 730
750 FOR F=139 TO 142
760 READ A$(F)
770 CALL CHAR(F,A$(F))
780 NEXT F
790 CALL CHAR(157,A$(141))
800 CALL CHAR(158,A$(142))
810 CALL CHAR(155,"FFF0F0F0")
820 CALL CHAR(156,"00000000F0FFFF")
830 CALL CHAR(45,"9942A59999A54299")
840 REM*** TITLE SCREEN
850 CALL SCREEN(2)
860 PRINT "          ": : : : : :
"          , SPACE ZAPPER ,": : : : : :
: : : : : :
870 PRINT "          INSTRUCTIONS? <Y/N>"
880 FOR F=2 TO 8
890 CALL COLOR(F,12,1)
900 NEXT F
910 CALL KEY(0,K,S)
920 IF K=89 THEN 1010
930 IF K=121 THEN 1010
940 IF K=78 THEN 1090
950 IF K=110 THEN 1090
960 CALL COLOR(2,1,1)
970 CALL COLOR(2,12,1)
980 CALL SOUND(100,1000,20)
990 GOTO 910
1000 REM*** INSTRUCTIONS
1010 CALL CLEAR
1020 PRINT TAB(8);"SPACE ZAPPER": :
: : : "YOU MUST DEFEND YOUR SP
ACE ZAPPER STATION ORBITING M
ARS"
1030 PRINT "FROM ENEMY SHIPS WHICH
ARE FIRING FROM ALL DIRECTION
S.": : "WHEN YOUR SHIELD POWER
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1040 PRINT "TO 0 STATION SPACE ZAPP
ER": "WILL EXPLODE.": : "USE THE
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YOUR GUNS."
1050 PRINT :TAB(10);"GOOD LUCK": :T
AB(8);"<HIT ANY KEY>"
1060 CALL KEY(0,K,S)
1070 IF S=0 THEN 1060
1080 REM*** GAME COLOURS
1090 CALL CLEAR
1100 CALL COLOR(2,12,1)
1110 FOR F=3 TO 8
1120 CALL COLOR(F,1,1)
1130 NEXT F
1140 FOR F=9 TO 12
1150 CALL COLOR(F,1,1)
1160 NEXT F
1170 FOR F=13 TO 15
```

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Zapper . . . from p. 29

```

1180 CALL COLOR(F,1,1)
1190 NEXT F
1200 CALL COLOR(16,5,1)
1210 REM*** SET UP SCREEN
1220 PRINT "      SHIELD POWER: 100"
      : : : : : : : : : : : : : : : :
      : : : : : : : : : : : : : : : :
1230 FOR F=3 TO 8
1240 CALL COLOR(F,12,1)
1250 NEXT F
1260 FOR F=13 TO 18
1270 CALL VCHAR(10,F,44,6)
1280 NEXT F
1290 CALL VCHAR(12,15,32,2)
1300 CALL VCHAR(12,16,32,2)
1310 CALL HCHAR(9,13,42)
1320 CALL HCHAR(9,18,41)
1330 CALL HCHAR(10,19,43)
1340 CALL HCHAR(15,19,42)
1350 CALL HCHAR(16,18,40)
1360 CALL HCHAR(16,13,43)
1370 CALL HCHAR(15,12,41)
1380 CALL HCHAR(10,12,40)
1390 CALL HCHAR(9,14,145)
1400 CALL HCHAR(9,15,144,2)
1410 CALL HCHAR(9,17,146)
1420 CALL HCHAR(8,15,147)
1430 CALL HCHAR(8,16,148)
1440 CALL HCHAR(11,19,138)
1450 CALL VCHAR(12,19,136,2)
1460 CALL HCHAR(14,19,137)
1470 CALL HCHAR(12,20,140)
1480 CALL HCHAR(13,20,139)
1490 CALL HCHAR(16,17,130)
1500 CALL HCHAR(16,15,128,2)
1510 CALL HCHAR(16,14,129)
1520 CALL HCHAR(17,16,132)
1530 CALL HCHAR(17,15,131)
1540 CALL HCHAR(14,12,153)
1550 CALL VCHAR(12,12,154,2)
1560 CALL HCHAR(11,12,152)
1570 CALL HCHAR(13,11,155)
1580 CALL HCHAR(12,11,156)
1590 CALL HCHAR(21,15,104,2)
1600 CALL HCHAR(4,15,120,2)
1610 CALL HCHAR(12,1,96)
1620 CALL HCHAR(13,1,97)
1630 CALL VCHAR(12,2,100,2)
1640 CALL HCHAR(12,3,98)
1650 CALL HCHAR(13,3,99)
1660 CALL HCHAR(12,30,115)
1670 CALL HCHAR(13,30,114)
1680 CALL VCHAR(12,29,116,2)
1690 CALL HCHAR(12,28,113)
1700 CALL HCHAR(13,28,112)
1710 REM*** BEGIN GAME
1720 LAST=16
1730 L=9
1740 SHIELDS=100
1750 N=0

```

```

1760 RANDOMIZE
1770 ON INT(RND*2)+1 GOTO 1780,2700
1780 P=0
1790 SHIP=0
1800 CALL KEY(1,K,S)
1810 IF K+1=1 THEN 1880
1820 IF K=2 THEN 2060
1830 IF K=3 THEN 2290
1840 IF K=5 THEN 2520
1850 IF SHIP>0 THEN 2900
1860 GOTO 1770
1870 REM*** FIRE DOWN
1880 IF LAST=13 THEN 1920
1890 CALL COLOR(LAST,1,1)
1900 CALL COLOR(13,5,1)
1910 LAST=13
1920 CALL VCHAR(18,15,133,3)
1930 CALL SOUND(-100,-5,20)
1940 CALL VCHAR(18,16,134,3)
1950 CALL SOUND(100,-5,20)
1960 CALL VCHAR(18,15,32,3)
1970 CALL VCHAR(18,16,32,3)
1980 IF P<>4 THEN 1850
1990 N=N+1
2000 CALL HCHAR(21,15,45,2)
2010 CALL SOUND(500,-6,10)
2020 CALL COLOR(10,1,1)
2030 CALL HCHAR(21,15,104,2)
2040 GOTO 1770
2050 REM*** FIRE LEFT
2060 IF LAST=16 THEN 2100
2070 CALL COLOR(LAST,1,1)
2080 CALL COLOR(16,5,1)
2090 LAST=16
2100 CALL HCHAR(12,4,157,7)
2110 CALL SOUND(-100,-5,20)
2120 CALL HCHAR(13,4,158,7)
2130 CALL SOUND(100,-5,20)
2140 CALL HCHAR(12,4,32,7)
2150 CALL HCHAR(13,4,32,7)
2160 IF P<>1 THEN 1850
2170 N=N+1
2180 CALL HCHAR(12,1,45,3)
2190 CALL HCHAR(13,1,45,3)
2200 CALL SOUND(500,-6,10)
2210 CALL COLOR(9,1,1)
2220 CALL HCHAR(12,1,96)
2230 CALL HCHAR(13,1,97)
2240 CALL VCHAR(12,2,100,2)
2250 CALL HCHAR(12,3,98)
2260 CALL HCHAR(13,3,99)
2270 GOTO 1770
2280 REM*** FIRE RIGHT
2290 IF LAST=14 THEN 2330
2300 CALL COLOR(LAST,1,1)
2310 CALL COLOR(14,5,1)
2320 LAST=14
2330 CALL HCHAR(12,21,141,7)
2340 CALL SOUND(-100,-5,20)
2350 CALL HCHAR(13,21,142,7)
2360 CALL SOUND(100,-5,20)

```


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Zapper

```
2370 CALL HCHAR(12, 21, 32, 7)
2380 CALL HCHAR(13, 21, 32, 7)
2390 IF P<3 THEN 1850
2400 N=N+1
2410 CALL HCHAR(12, 28, 45, 3)
2420 CALL HCHAR(13, 28, 45, 3)
2430 CALL SOUND(500, -6, 10)
2440 CALL COLOR(11, 1, 1)
2450 CALL HCHAR(12, 28, 113)
2460 CALL HCHAR(13, 28, 112)
2470 CALL VCHAR(12, 29, 116, 2)
2480 CALL HCHAR(12, 30, 115)
2490 CALL HCHAR(13, 30, 114)
2500 GOTO 1770
2510 REM*** FIRE UP
2520 IF LAST=15 THEN 2560
2530 CALL COLOR(LAST, 1, 1)
2540 CALL COLOR(15, 5, 1)
2550 LAST=15
2560 CALL VCHAR(5, 15, 149, 3)
2570 CALL SOUND(-100, -5, 20)
2580 CALL VCHAR(5, 16, 150, 3)
2590 CALL SOUND(100, -5, 20)
2600 CALL VCHAR(5, 15, 32, 3)
2610 CALL VCHAR(5, 16, 32, 3)
2620 IF P>2 THEN 1850
2630 N=N+1
2640 CALL HCHAR(4, 15, 45, 2)
2650 CALL SOUND(500, -6, 10)
2660 CALL COLOR(12, 1, 1)
2670 CALL HCHAR(4, 15, 120, 2)
2680 GOTO 1770
2690 REM PICK ENEMY TO APPEAR
2700 RANDOMIZE
2710 F=INT(RND*4)+1
2720 ON F GOSUB 2770, 2800, 2830, 2860
2730 SHIP=1
2740 RANDOMIZE
2750 T=INT(RND*5)+1
2760 GOTO 1800
2770 CALL COLOR(9, 3, 1)
2780 L=9
2790 RETURN
2800 CALL COLOR(12, 3, 1)
2810 L=12
2820 RETURN
2830 CALL COLOR(11, 3, 1)
2840 L=11
2850 RETURN
2860 CALL COLOR(10, 3, 1)
2870 L=10
2880 RETURN
2890 REM*** DOES ENEMY
2900 *** FIRE?
2910 SHIP=SHIP+1
2920 IF SHIP<1 THEN 1800
2930 REM*** ENEMY FIRES
2940 ON F GOSUB 2990, 3060, 3130, 3200
2950 SHIELDS=SHIELDS-INT(RND*10+5)
2960 IF SHIELDS<1 THEN 3360
2970 GOSUB 3280
```

```
2970 CALL COLOR(L, 1, 1)
2980 GOTO 1760
2990 CALL HCHAR(12, 4, 101, 7)
3000 CALL SOUND(-100, -5, 20)
3010 CALL HCHAR(13, 4, 102, 7)
3020 CALL SOUND(100, -5, 20)
3030 CALL HCHAR(12, 4, 32, 7)
3040 CALL HCHAR(13, 4, 32, 7)
3050 RETURN
3060 CALL VCHAR(5, 15, 121, 3)
3070 CALL SOUND(-100, -5, 20)
3080 CALL VCHAR(5, 16, 122, 3)
3090 CALL SOUND(100, -5, 20)
3100 CALL VCHAR(5, 15, 32, 3)
3110 CALL VCHAR(5, 16, 32, 3)
3120 RETURN
3130 CALL HCHAR(12, 21, 117, 7)
3140 CALL SOUND(-100, -5, 20)
3150 CALL HCHAR(13, 21, 118, 7)
3160 CALL SOUND(100, -5, 20)
3170 CALL HCHAR(12, 21, 32, 7)
3180 CALL HCHAR(13, 21, 32, 7)
3190 RETURN
3200 CALL VCHAR(18, 15, 105, 3)
3210 CALL SOUND(-100, -5, 20)
3220 CALL VCHAR(18, 16, 106, 3)
3230 CALL SOUND(100, -5, 20)
3240 CALL VCHAR(18, 15, 32, 3)
3250 CALL VCHAR(18, 16, 32, 3)
3260 RETURN
3270 REM*** SHIELD POWER
3280 *** READOUT
3290 SHIELDS%=STR$(SHIELDS)
3300 CALL HCHAR(2, 22, 32, 4)
3310 FOR F=22 TO 21+LEN(SHIELDS%)
3320 B%=SEG$(SHIELDS%, F-21, 1)
3330 CALL HCHAR(2, F, ASC(B%))
3340 NEXT F
3350 RETURN
3360 REM*** EXPLOSION OF
3370 *** SPACE ZAPPER
3380 CALL SOUND(-1000, -7, 28)
3390 CALL HCHAR(12, 15, 45, 2)
3400 CALL HCHAR(13, 15, 45, 2)
3410 CALL SOUND(-1000, -7, 20)
3420 CALL HCHAR(11, 14, 45, 4)
3430 CALL VCHAR(12, 17, 45, 3)
3440 CALL HCHAR(14, 14, 45, 3)
3450 CALL VCHAR(12, 14, 45, 2)
3460 CALL SOUND(-1000, -7, 10)
3470 CALL HCHAR(10, 13, 45, 6)
3480 CALL VCHAR(11, 18, 45, 5)
3490 CALL HCHAR(15, 13, 45, 5)
3500 CALL VCHAR(11, 13, 45, 4)
3510 CALL SOUND(-1000, -7, 0)
3520 CALL HCHAR(9, 12, 45, 8)
3530 CALL VCHAR(10, 19, 45, 7)
3540 CALL HCHAR(16, 12, 45, 7)
3550 CALL VCHAR(10, 12, 45, 7)
3560 CALL SOUND(-1000, -7, 0)
```

Continued on p. 36

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```
1050 CALL HCHAR(FH,FV,120):: CALL H
CHAR(FH,FV-1,36):: CALL SOUND(
-100,6000,0,8000,0):: RETURN
1060 CALL HCHAR(FH,FV,120):: CALL H
CHAR(FH+1,FV,36):: CALL SOUND(
-100,6000,0,8000,0):: RETURN
1070 CALL HCHAR(FH,FV,120):: CALL H
CHAR(FH-1,FV,36):: CALL SOUND(
-100,6000,0,8000,0):: RETURN
1080 CALL SOUND(100,2000,0):: CALL
SOUND(100,1000,0)
1090 LET DEUF=DEUF+1
1100 CALL HCHAR(2,DEUF,97)
1110 CALL HCHAR(FH,FV,36)
1120 IF DEUF=7 THEN 2160
```

```
1130 FH=22 :: FV=30 :: CALL HCHAR(F
H,FV,120)
1140 TIM=0
1150 RETURN
1160 CALL GCHAR(AA+1,BB,XZ)
1170 IF XZ=120 THEN GOSUB 1190
1180 RETURN
1190 CALL SOUND(100,110,0):: CALL S
OUND(100,500,0)
1200 LET ANT=ANT+1
1210 CALL HCHAR(2,ANT,36)
1220 GOSUB 2280
1230 TIM=0
1240 IF ANT=30 THEN 2160
1250 FH=22 :: FV=30
1260 CALL HCHAR(FH,FV,120)
1270 RETURN
1280 RANDOMIZE :: TONG=INT(RND*9)+1
```

```
1290 ON TONG GOSUB 1800,1820,1840,1
860,1880,1900,1920,1940,1960
1300 REM
1310 FOR I=1 TO 13
1320 READ AA,BB,CC
1330 GOSUB 1160
1340 CALL HCHAR(AA+1,BB,CC)
1350 NEXT I
1360 ON TONG GOSUB 1980,2000,2020,2
040,2060,2080,2100,2120,2140
1370 CALL SOUND(1500,-5,10)
1380 FOR I=1 TO 13
1390 READ AA,BB,CC
1400 CALL HCHAR(AA+1,BB,CC)
1410 NEXT I
1420 GOSUB 2340
1430 RETURN
1440 DATA 20,14,36,19,14,36,18,14,3
6,17,14,36,16,14,36,15,14,36,1
4,14,36,13,14,36
1450 DATA 12,14,36,11,14,36,10,14,3
6,9,14,36,8,14,36,0,0,0,0,0,0
1460 DATA 14,20,36,14,19,36,14,18,3
6,13,18,36,13,17,36,13,16,36,1
3,15,36
1470 DATA 13,14,36,12,14,36,11,14,3
6,10,14,36,9,14,36,8,14,36,0,0
,0,0,0,0
1480 DATA 10,24,36,10,23,36,10,22,3
6,10,21,36,10,20,36,10,19,36
1490 DATA 10,18,36,10,17,36,10,16,3
6,10,15,36,10,14,36,9,14,36,8,
14,36,0,0,0,0,0,0
1500 DATA 10,4,36,10,5,36,10,6,36,1
0,7,36,10,8,36,10,9,36,10,10,3
6
1510 DATA 10,11,36,10,12,36,10,13,3
6,10,14,36,9,14,36,8,14,36,0,0
,0,0,0,0
1520 DATA 12,8,36,12,9,36,13,9,36,1
3,10,36,13,11,36,13,12,36,13,1
3,36,13,14,36
1530 DATA 12,14,36,11,14,36,10,14,3
6,9,14,36,8,14,36,0,0,0,0,0,0
1540 DATA 15,9,36,15,10,36,14,10,36
,13,10,36,13,11,36,12,11,36,11
,11,36
1550 DATA 10,11,36,10,12,36,10,13,3
6,10,14,36,9,14,36,8,14,36,0,0
,0,0,0,0
1560 DATA 13,7,36,12,7,36,12,8,36,1
1,8,36,10,8,36,10,9,36
1570 DATA 10,10,36,10,11,36,10,12,3
6,10,13,36,10,14,36,9,14,36,8,
14,36,0,0,0,0,0,0
1580 DATA 18,16,36,17,16,36,16,16,3
6,15,16,36,14,16,36,13,16,36
1590 DATA 13,15,36,13,14,36,12,14,3
6,11,14,36,10,14,36,9,14,36,8,
14,36,0,0,0,0
1600 DATA 17,11,36,16,11,36,15,11,3
6,15,12,36,15,13,36
1610 DATA 15,14,36,14,14,36,13,14,3
6,12,14,36,11,14,36,10,14,36,9
,14,36,8,14,36,0,0,0,0,0,0
1620 DATA 8,14,96,9,14,96,10,14,96,
11,14,96,12,14,96,13,14,96
1630 DATA 14,14,96,15,14,96,16,14,9
6,17,14,96,18,14,96,19,14,96,2
0,14,96,21,14,96,0,0,0,0,0,0
1640 DATA 8,14,96,9,14,96,10,14,96,
11,14,96,12,14,96,13,14,96,13,
15,99,13,16,99,13,17,99
1650 DATA 13,18,100,14,18,98,14,19,
99,14,20,99,0,0,0,0,0,0
1660 DATA 8,14,96,9,14,96,10,14,96,
10,14,98,10,15,99,10,16,99,10,
17,99,10,18,99,10,19,99
1670 DATA 10,20,99,10,21,99,10,22,9
9,10,23,99,10,24,99,0,0,0,0,0,0
1680 DATA 8,14,96,9,14,96,10,14,101
,10,13,99,10,12,99,10,11,99,10
,10,99
1690 DATA 10,9,99,10,8,99,10,7,99,1
0,6,99,10,5,99,10,4,99,0,0,0,0
,0,0
1700 DATA 8,14,96,9,14,96,10,14,96,
11,14,96,12,14,96,13,14,101,13
,13,99,13,12,99,13,11,99,13,10
,99
```

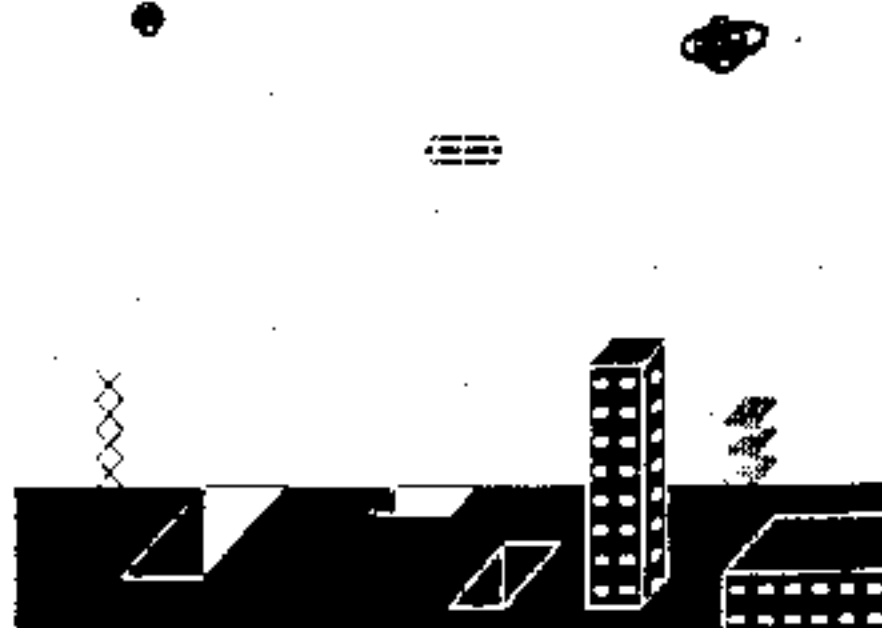
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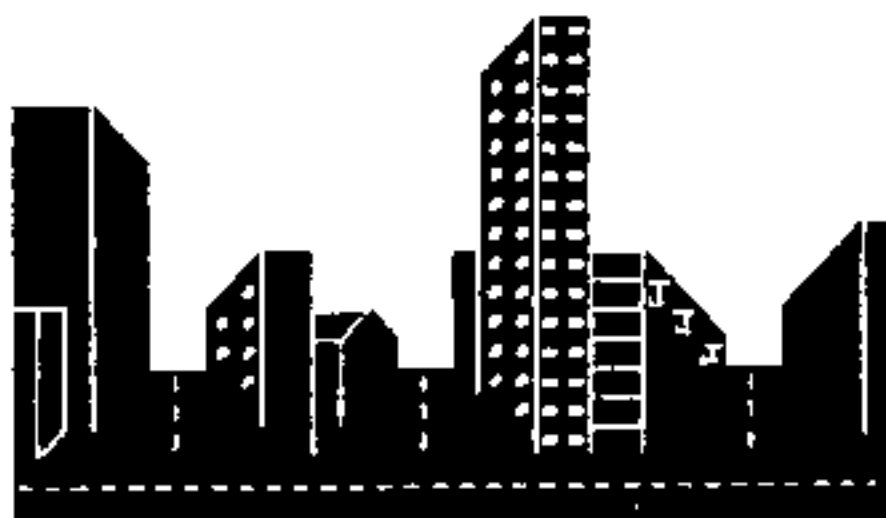
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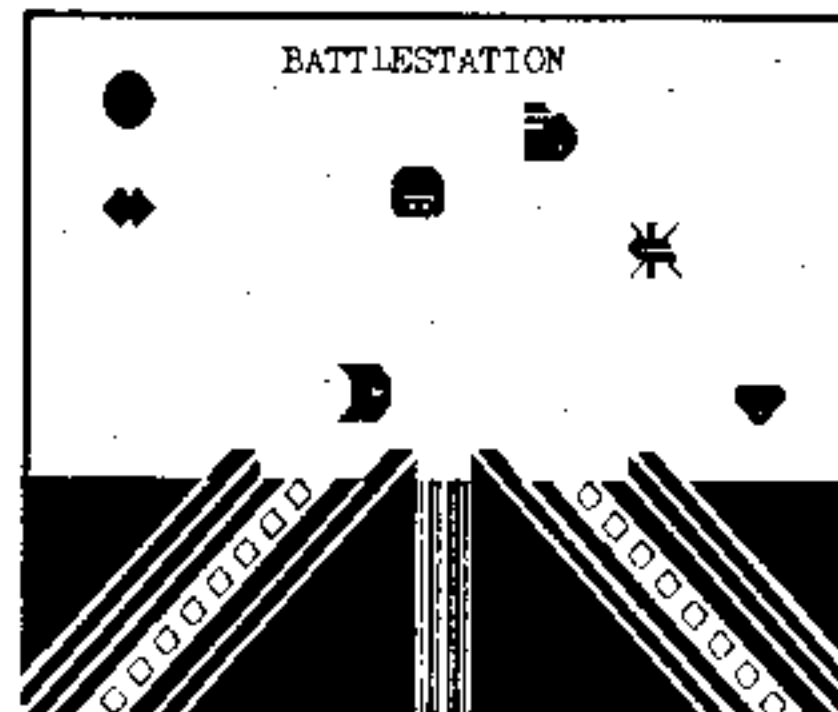
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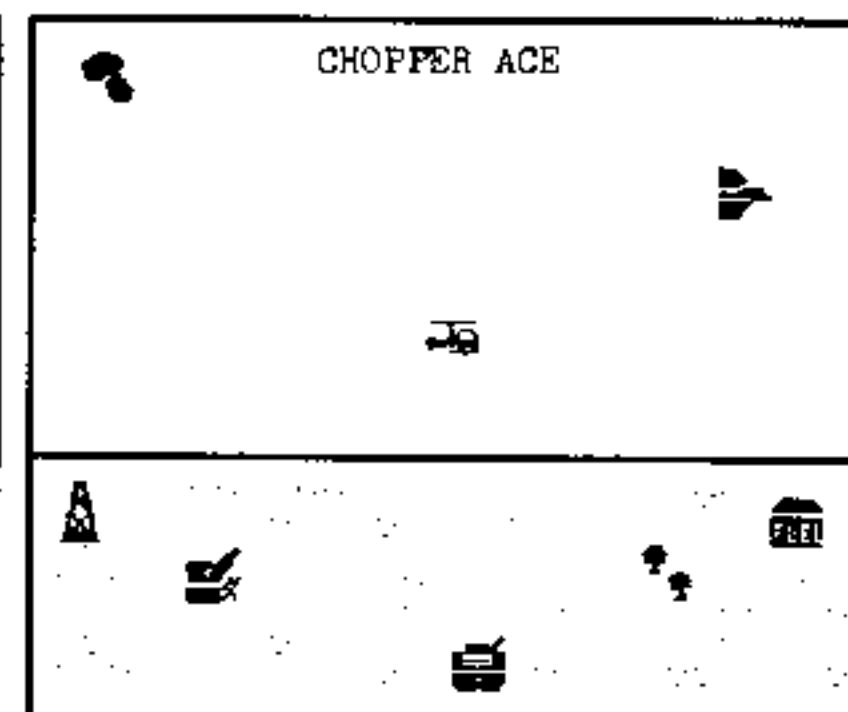
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SCHEDULED 99/8 INTRO POSTPONED--4A CHANGES COLOR

The much-talked-about 99/8 Home Computer will not be formally introduced at the June Consumer Electronics Show (CES) as anticipated. With market conditions changing so rapidly, it appears that TI prefers to delay a pricing decision until closer to actually being able to "stock the shelves" --likely in 4th quarter for the holiday buying season. This would signify a major departure from TI's traditional marketing policy of anchoring new product announcements to the January and June CES events. Industry analysts expect the 4A's "Big Brother" to carry a price tag somewhere in the \$200--\$500 range at the time of launch. Meanwhile, Lubbock gears up for producing the 99/4A computer consoles and peripherals in a new gray color. TI's choice of lighter colors is said to be based on consumer color preference. The on-off switch gets moved from the right front edge to the lower right top surface, and cost reductions on the printed circuit board will be implemented.

NEW HEX-BUS PERIPHERALS USHER IN TI EXCLUSIVITY POLICY

Two new Hex-bus peripherals are to be CES announced for 4th quarter availability: The \$99.95 HX-3100 Telephone Modem is a 300-baud, direct connect, full-duplex device connecting directly to the CC-40 or to the 99/4A through the previously announced Hex-bus Adapter. The HX-1100 Video Interface provides CC-40 users with a 40 character by 24-line screen display on TV or video monitor. TI states that "a patent is pending on the Hex-bus system . . . [and it] does not intend to license this patent to others for manufacturing or distributing peripherals for TI computers . . . TI will enforce this patent against unauthorized use by outside parties."

MBX VOICE RECOGNITION SYSTEM COMES HOME AT HIGHER PRICE

TI's formal June CES announcement of the Milton Bradley MBX Expansion System for the 99/4A (first shown at last January's CES) will "unbundle" the keypad unit from its multi-function joystick, so that the pair will carry a combined suggested retail price (SRP) of about \$160--over double the price as originally predicted by MB. Software cartridges for the MBX System are being priced at an SRP of \$49.95 for packages "enhanced by use of" the system, and \$59.95 for those that "require use of" the system.

NEW SOFTWARE FORMS BULK OF CES OFFERINGS

CES attendees are expected to see previews of 4 new arcade games, a word processor, and 6 educational packages for the Home Computer. M*A*S*H, Sneggit, and Moonmine are cartridge-based; Entrapment, will be on cassette for loading with and RUNing from the Mini Memory cartridge. A TI-Mini Writer cassette--also for use with Mini Memory--will be announced for 3rd-quarter availability. With an SRP of \$19.95, the product provides word-processing capability at minimum cost. TI's educational packages illustrate an aggressive software acquisitions program--all six developed outside of TI. Early LOGO Learning Fun from the Lamplighter School is the first cartridge release of LOGO activity procedures. July availability expected. The remaining 5 packages for 4th-quarter release include 3 E.T.-based educational software games from Looking Glass Software, and 2 vocabulary/grammar games from Development Learning Materials, Inc. All game and education cartridges carry a \$39.95 SRP.

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(*) requires RS232 interface, modem & a fellow 99'er similarly equipped. Each player must have a copy of the program (order two). All programs require Extended Basic. Multiple programs furnished on same tape or disk.

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Aardvark ... from p. 33

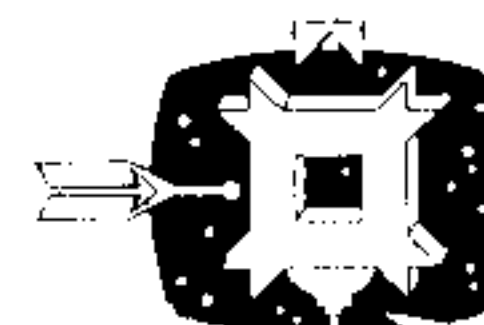
```
1710 DATA 13,9,98,12,9,100,12,8,99,
0,0,0,0,0,0
1720 DATA 8,14,96,9,14,96,10,14,101,
10,13,99,10,12,99,10,11,102,1
1,11,96
1730 DATA 12,11,96,13,11,101,13,10,
102,14,10,96,15,10,101,15,9,99,
0,0,0,0,0,0
1740 DATA 8,14,96,9,14,96,10,14,101,
10,13,99,10,12,99,10,11,99,10,
10,99,10,9,99,10,8,102,11,8,9
6
1750 DATA 12,8,101,12,7,102,13,7,96,
0,0,0,0,0,0
1760 DATA 8,14,96,9,14,96,10,14,96,
11,14,96,12,14,96,13,14,98,13,
15,99
1770 DATA 13,16,100,14,16,96,15,16,
96,16,16,96,17,16,96,18,16,96,
0,0,0,0,0,0
1780 DATA 8,14,96,9,14,96,10,14,96,
11,14,96,12,14,96,13,14,96,14,
14,96,15,14,101,15,13,99,15,12,
99
1790 DATA 15,11,102,16,11,96,17,11,
96,0,0,0,0,0,0
1800 RESTORE 1620
1810 RETURN
1820 RESTORE 1640
1830 RETURN
1840 RESTORE 1660
1850 RETURN
1860 RESTORE 1680
1870 RETURN
1880 RESTORE 1700
1890 RETURN
1900 RESTORE 1720
1910 RETURN
1920 RESTORE 1740
1930 RETURN
1940 RESTORE 1760
1950 RETURN
1960 RESTORE 1780
```

```
1970 RETURN
1980 RESTORE 1440
1990 RETURN
2000 RESTORE 1460
2010 RETURN
2020 RESTORE 1480
2030 RETURN
2040 RESTORE 1500
2050 RETURN
2060 RESTORE 1520
2070 RETURN
2080 RESTORE 1540
2090 RETURN
2100 RESTORE 1560
2110 RETURN
2120 RESTORE 1580
2130 RETURN
2140 RESTORE 1600
2150 RETURN
2160 CALL CLEAR :: CALL DELSPRITE(#
1):: CALL DELSPRITE(#2)
2170 CALL CHAR(140,"780E0C1F3F373F0
F1E46AF532519020C8000000000000
00000F0FCFEFEF850CF")
2180 CALL SPRITE(#1,128,5,49,180,#2,
132,5,49,207)
2190 CALL SPRITE(#3,140,14,108,180)
2200 CALL COLOR(8,2,1)
2210 DISPLAY AT(6,5):ANT-25," ANTS
FOURMIS
"
2220 DISPLAY AT(15,5):OEUF-2," FOOD
NOURRI
TURE"
2230 DISPLAY AT(21,1):"TAPEZ UNE CL
EF * PRESS A KEYFOUR ENCORE...
* TO START *
AGAIN."
2240 CALL KEY(0,K,S):: IF S=0 THEN
2240
2250 CALL DELSPRITE(ALL)
2260 GOTO 180
2270 END
2280 FOR R=1 TO 10 :: CALL PATTERN(
#1,136):: CALL PATTERN(#2,140)
```

```
2290 CALL SOUND(-1,3000,0,-8,0)
2300 CALL PATTERN(#1,128):: CALL PA
TTERN(#2,132)
2310 FOR Z=1 TO 25 :: NEXT Z
2320 NEXT R
2330 RETURN
2340 FOR I=1 TO 4 :: CALL PATTERN(#
2,140)
2350 CALL SOUND(-1,110,0,-8,0)
2360 CALL PATTERN(#2,132)
2370 FOR Z=1 TO 25 :: NEXT Z
2380 NEXT I
2390 RETURN
```

Zapper ... from p. 31

```
3550 CALL SCREEN(7)
3560 CALL SCREEN(12)
3570 CALL SCREEN(3)
3580 CALL SCREEN(5)
3590 CALL SCREEN(2)
3600 CALL CLEAR
3610 PRINT "STATION SPACE ZAPPER HA
S BEEN BROKEN DOWN INTO ITS
SEPARATE MOLECULES....": :
: :
3620 PRINT "YOU SUCCESSFULLY SHOT D
OWN";N;"ENEMIES." : : : : :
:
3630 FOR F=1 TO 1000
3640 NEXT F
3650 CALL CLEAR
3660 FOR F=2 TO 8
3670 CALL COLOR(F,1,1)
3680 NEXT F
3690 GOTO 850
```



Natural Language Technology Advances

— From Texas Instruments Data Systems News —

One of the computer industry's first natural language interfaces for desk-top work stations is being developed for TI's new Professional Computer. Common English words and phrases are used to ask questions of the data base or to give commands for specific tasks. "We think it sets a new standard for ease of use," explained Data Systems Group President Eric Jones.

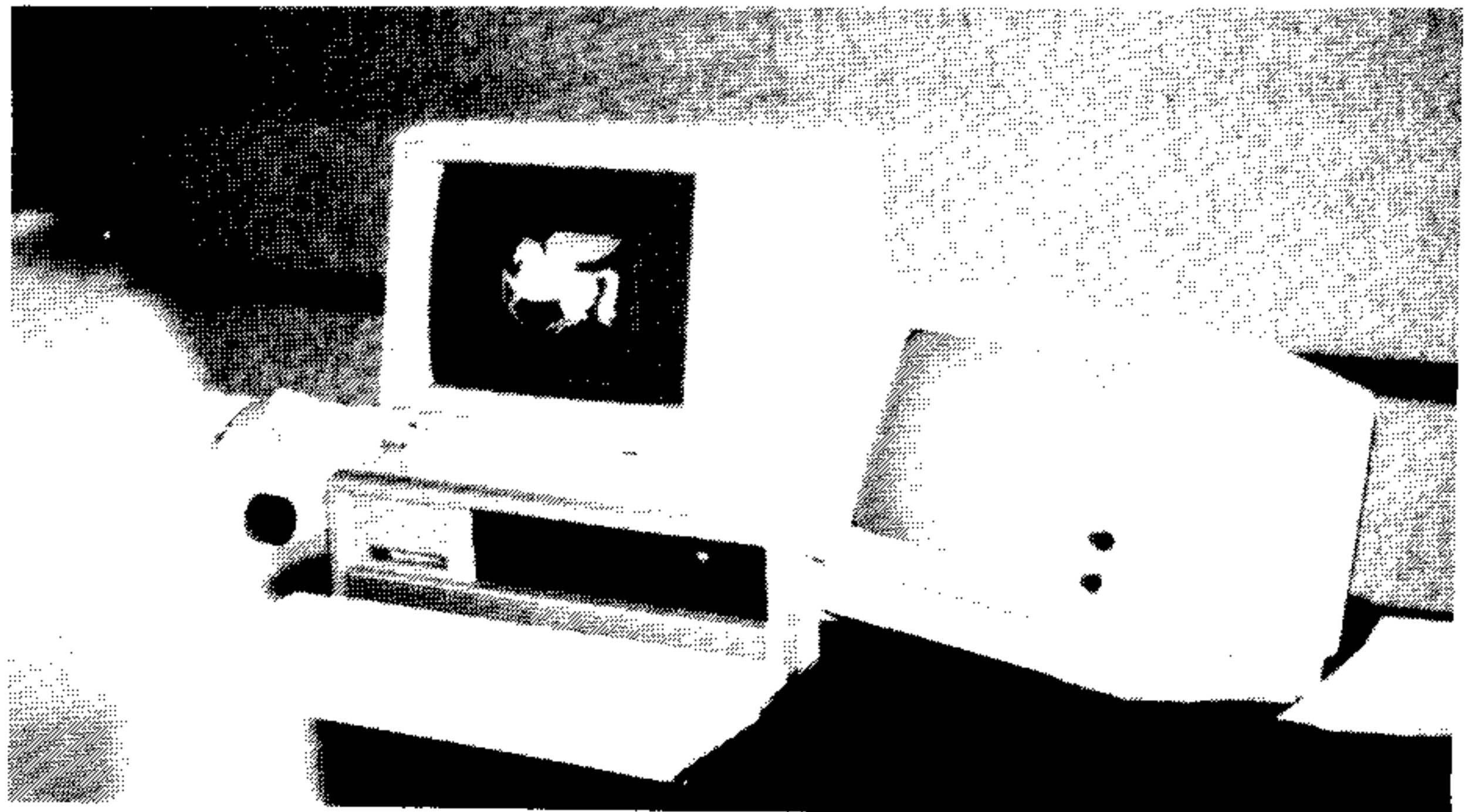
The interfaces are supplied on disks and designed so that they can be customized to meet the particular needs of specific users. "Help" facilities are built into the capabilities at all levels to aid users who are unsure of the procedures.

Each TI natural language interface provides a user-friendly, menu-driven method of specifying an English language query or command in a highly structured manner. The video display screen is divided into several windows, with each window offering a choice of items to be selected. The system is structured to make available only those items that are logically compatible with previous selections. As each item is selected from the windows, a plain English sentence is constructed at the bottom of the screen, describing the function to be performed. By pressing just four keys, you can compose any possible question. Variables like quantity and part number are typed in, one character at a time, when the display asks for them. Key words to be searched for, like company names and city names, are typed in conventionally.

The natural language interface to the Dow Jones Data Base, for example, allows a user to build an English-like sentence instructing the TI Professional Computer to display a particular company's stock quotes from the composite tape for the last ten trading days.

Previous natural language interfaces used with large mainframe computers have had the ability to query a data base with English-like sentences, but their ability to actually understand meanings was limited to certain sentences. Users of such interfaces, however, were not limited in what they could ask. Thus, a significant amount of time could be wasted before the system realized that a query had been entered that it was not designed to understand.

The TI natural language interfaces actually lead users through the sentence-building process and, since the interfaces help to structure the sentence options, understanding is enhanced. By structuring the interfaces within certain grammatical confines, users should not have to face the situation of asking questions that cannot be answered.



A user responds to the natural language interface prompts on the Professional Computer code named *Pegasus*.

If a user is not exactly sure what question to ask, the interface prompts him or her through all the available steps to determine which questions are valid in view of the selections that have already been made. If a user sees that selections are not going to produce the desired results, he or she can "rub out" the necessary selections and backtrack. The interface then translates the natural English language selections from the English on the screen into the data language understood by the computer.

An advantage of these TI natural language interfaces is their ability to be

tailored to meet individual situations. For example, one interface could be created for use by company management, while another could be provided for use by those who have no need to access information of a sensitive nature.

Products based on the natural language capability are scheduled to be released later this year.

99'er

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This column is an ongoing tutorial. Parts one and two appeared in the April and May, 1983, issues of 99'er HCM. To obtain full benefits from this column, a newcomer to *Multiplan* may find it useful to read the previously printed columns.

Microsoft's *Multiplan* is a great tool for manipulating numerical information. But numbers on the computer screen are not always enough to tell the whole story, so *Multiplan* also has features for handling text and printing. In fact, *Multiplan* has so many capabilities that it may seem like it can be used for almost anything.

I have found a few types of situations, however, which *Multiplan* does not handle well. These are not shortcomings of the program, because *Multiplan* was not designed to do everything. But these situations are so common that it is worthwhile to mention them. This little survey of its limitations will also give you an idea—by process of elimination—of what *Multiplan* is good for.

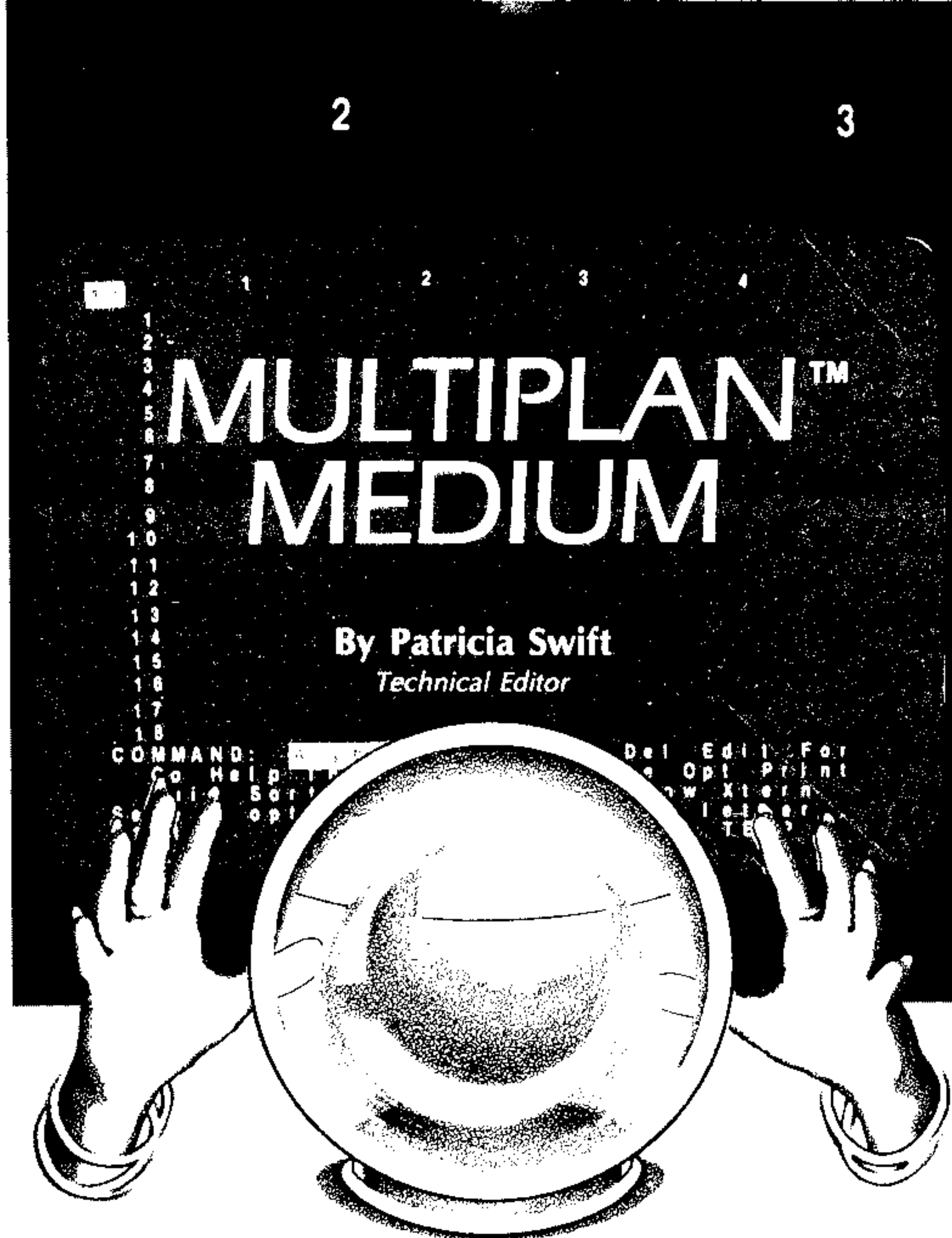
What Multiplan Can't Do

In spite of its text-editing features, *Multiplan* is not a word processor. If you want to prepare documents which consist mainly of words (text), you will be much better off using *TI-Writer* or another program designed specifically for text editing or word processing. This is not to say that *Multiplan* could not be used to create and edit these types of documents; it just wouldn't be very convenient for the user because of the row and column layout.

Nor does *Multiplan* shine in situations where quantities of information must be entered into the computer and then distributed selectively for processing. A good example of this is a common business task—keeping track of invoices and billing customers. *Multiplan* works well for entering the invoice information in as much detail as the user needs, but it is difficult (though not impossible) to get *Multiplan* to move these detailed invoices into each customer's account. There are programs which do this sort of thing well, including specialized accounting and more general programs called *data base managers*.

Multiplan is also limited in the amount of information it can hold. This can be overcome by linking worksheets together, but that is sometimes inconvenient.

It is interesting to note that I have not described anything that absolutely *could not* be done with *Multiplan*. It is more a question of how much time it takes to get *Multiplan* to produce the desired result. Once you learn to use the program and understand how it thinks, you will probably be able to devise a way to use *Multiplan* for everything you do.



Worksheets, Templates and Models

The *worksheet* is the medium of communication between you and *Multiplan*. A worksheet is just a rectangular arrangement of rows and columns of information. With *Multiplan*, instead of using pencil, paper and calculator, you fill in an electronic worksheet and let the program do the calculations. In setting up the electronic worksheet you are really describing the problem to *Multiplan*. Worksheets are also called "templates" or "models." These terms express another idea which is central to *Multiplan*: A worksheet is a mathematical representation of a certain situation, and thus can be reused to evaluate similar situations. A purist might call it a worksheet while it is being developed and a template or model once it is finished, but I use the three terms interchangeably.

Multiplan places information in rectangular blocks of cells. A single cell, the smallest unit on the worksheet, is identified by its unique row and column number (or sometimes by name, as you will see later). A column on the worksheet can be thought of as a rectangular area of cells where the rectangle is just one cell wide. Similarly, a row is a rectangle one cell high. Larger rectangular areas can also be easily referenced. It's helpful to keep this basic idea in mind when you design a worksheet.

The first step in designing a worksheet with *Multiplan* is to picture your problem in a row and column layout. If your problem is complex, you might want to sketch it roughly on paper first. Remember that you are limited to 256 rows and 63 columns. Then sit down with the 99/4A and *Multiplan*, and enter your idea onto a clean electronic worksheet.

You will probably want to use headings and descriptive text on the worksheet. It is easiest to enter these first, using the ALPHA command to give you a frame of reference. I often find that descriptions need to be longer than the eight characters you get by default. Widening the columns is a bad idea, however, because then you can see only a few columns on the screen at once. The perfect solution is to leave the columns eight characters wide while you set up the worksheet and then expand them later for printing and storage. (You can go as wide as 32 characters). *Multiplan* makes this easy to do by letting you type in the full description, but only displaying as many characters as will fit in the width currently set for that column. When you widen the column later, the longer description will appear.

The next task is to enter the numbers on the worksheet. Just as *Multiplan* has a default column width, it also has a built-in way of expressing numbers unless you say otherwise. This default

format is called the general format. *Multiplan* will show as many digits to the left of the decimal point as it takes to express the number exactly, or as will fit in the column. You can change this default format if you want. You should set the default format to correspond to the most common type of number you will use. For example, if most of the numbers on your worksheet will be dollars and cents, then you should change the default format to always show two decimal places. *Multiplan* also allows you to change the formats of specific cells, so you can have exceptions to the default format.

After you enter the known numbers, you are ready to have *Multiplan* calculate the unknowns. *Multiplan* has many functions for this and they will be covered in detail in future articles. The calculations can be simple or quite complex.

Meaningful Interaction

As you build the worksheet, you will probably want to change its layout as you go along. *Multiplan* is a highly interactive program. This means that it expects to have a give-and-take relationship with its user. *Multiplan* also strives to be convenient for you to use. That is why it uses defaults: It makes assumptions about the situation, and you need to specify only when things are different. In addition to anticipating your wishes with the defaults for column width and format, *Multiplan* also pays attention to the position of the cell pointer. For example, suppose you decide that you need to insert a row of information between rows 2 and 3 on your worksheet. If you choose the INSERT command, you will be given a chance to specify how many rows to insert and where they should be inserted. If you position the cell pointer on row 3 before choosing the INSERT command, *Multiplan* will automatically note that the new row will be inserted before row 3. *Multiplan* also remembers how many rows you inserted. The next time you invoke the INSERT command in the same session, the program will suggest that you insert the same number of rows as last time. Of course, you always have a chance to override these suggestions.

You will notice that as you get more information on a worksheet, it takes longer for *Multiplan* to accept the next input from you. This is because of its *re-calc* facility. Each time you fill in a cell, *Multiplan* looks at the other cells to see if their contents should be changed to reflect the information you just entered. This can really slow you down when you are designing a worksheet. But don't worry—you can turn off the *re-calc* while you enter and polish your worksheet, and then turn it on again when you want *Multiplan* to perform calculations. The OPTIONS command lets you do this.

If you get stuck on your worksheet, *Multiplan* is always ready to help. You can choose the HELP command for a comprehensive selection of topics. As options under HELP, you can choose Applications, Commands, Editing, Formulas, or Keyboard to see explanations of those subjects. You can also page backward and forward through this help file if you are really lost. And *Multiplan* provides the information in plain English. You can also get help by entering a question mark at any time, except in the middle of a text string (the ALPHA command). When you use the question mark after you have selected a command or option, *Multiplan* shows you the portion of its help file which deals with the command or option you have chosen.

Before you consider a worksheet finished, be sure to test it. After all, you might have made a mistake in a formula for a calculation. You can check it by using very simple numbers on the first worksheet, or by verifying the results with a calculator.

Saving the Results

If you have a printer, you'll probably want to PRINT the finished worksheet. You can specify to print only certain portions of the worksheet, and you can instruct *Multiplan* to print the

worksheet on several pages if it will not fit on one page. I often have worksheets which are between 81 and 132 columns wide. With my printer in compressed mode, I can fit these on a single page. Unfortunately, I know of no way to put my printer in compressed mode with *Multiplan*; so I use a BASIC program to select compressed print before I go into *Multiplan*. (If you decide to do this when you are in the middle of a worksheet, be sure to use the SAVE option to preserve what you've entered before you go to BASIC.) You must also specify the printer setup string for your particular printer; just use the string you normally use in the OPEN statement for BASIC. You can cancel the printed output in the middle of printing by using the CANCEL key (CTRL =); this is handy if the output looks wrong.

If you have a word processor such as *TI-Writer*, you can "print" the worksheet to a disk file for editing on your word processor. You get to specify the name of the disk file to use. In this way, you can incorporate the worksheet created by *Multiplan* into a longer document.

You will also want to save the finished worksheet to disk via the Save option of the TRANSFER command. If the worksheet name is still the default TEMP, you should use the Rename option to save the worksheet under a more meaningful name. I usually save my worksheet after I have printed it, because that way the printer setup commands are also saved, but it never hurts to save the worksheet earlier as well.

Although *Multiplan* allows you to have file names with lower case letters, it is best to limit yourself to upper case letters (and numbers) in the file names you choose. TI's *Disk Manager* has problems with lower case letters, and so may other packages.

Multiplan itself has no graphics capabilities. However, it does allow you to TRANSFER the information from the worksheet to a disk file in *symbolic* format. This symbolic file can then be read by programs written in other languages. I have not tried this yet, but it probably means that you can do such things as graph *Multiplan* results using BASIC and Assembly Language programs of your own.

Using a Template

Once your worksheet is finished and stored on disk, the real power of *Multiplan*—its ability to evaluate similar situations containing different information—can be unleashed. The next time you have a similar situation to analyze, you can recall the template and fill in some new information. For some models, this will mean entering this month's figures; for others, it will just be a matter of changing a number or two. The point is that your relationships are all set up, so all you have to do is change the "givens."

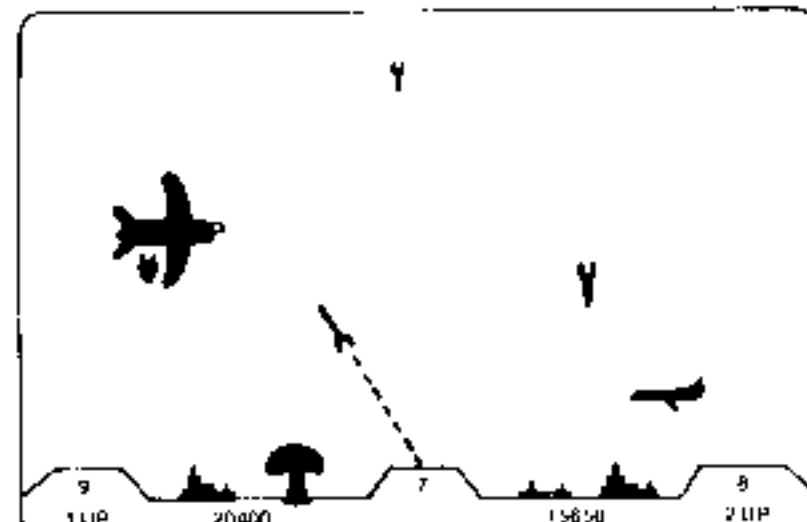
Think of the budget example in the last issue. You can use this model (or a variation of it) each month to track your expenses after the fact. But you could also use it when considering a major expenditure. You could add the hypothetical expense to the appropriate category and see what this would leave you to spend for each month left in the year. Or you could change the inflation rate, and immediately see how you will be affected.

The nice thing about using these electronic models (in addition to the time you save) is that you can experiment without fear of losing your original model. You can have *Multiplan* LOAD in the original model, and then manipulate it all you want. If you mess things up, you can always QUIT *Multiplan* without SAVEing the new model on disk. If your experiments on the model are successful, you can SAVE the new version on disk with a different name and still preserve the original as well. These basic principles apply to *Multiplan* as a whole. Understanding them will make it easier to follow the *Multiplan* discussions in the articles to come.



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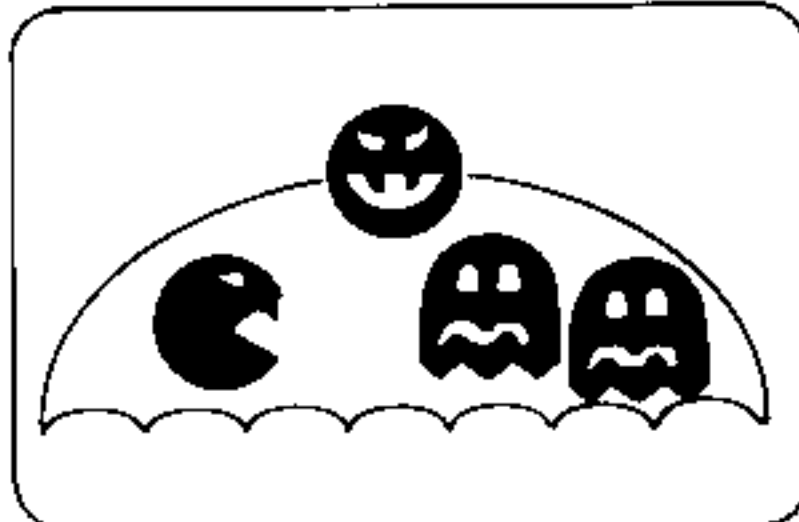
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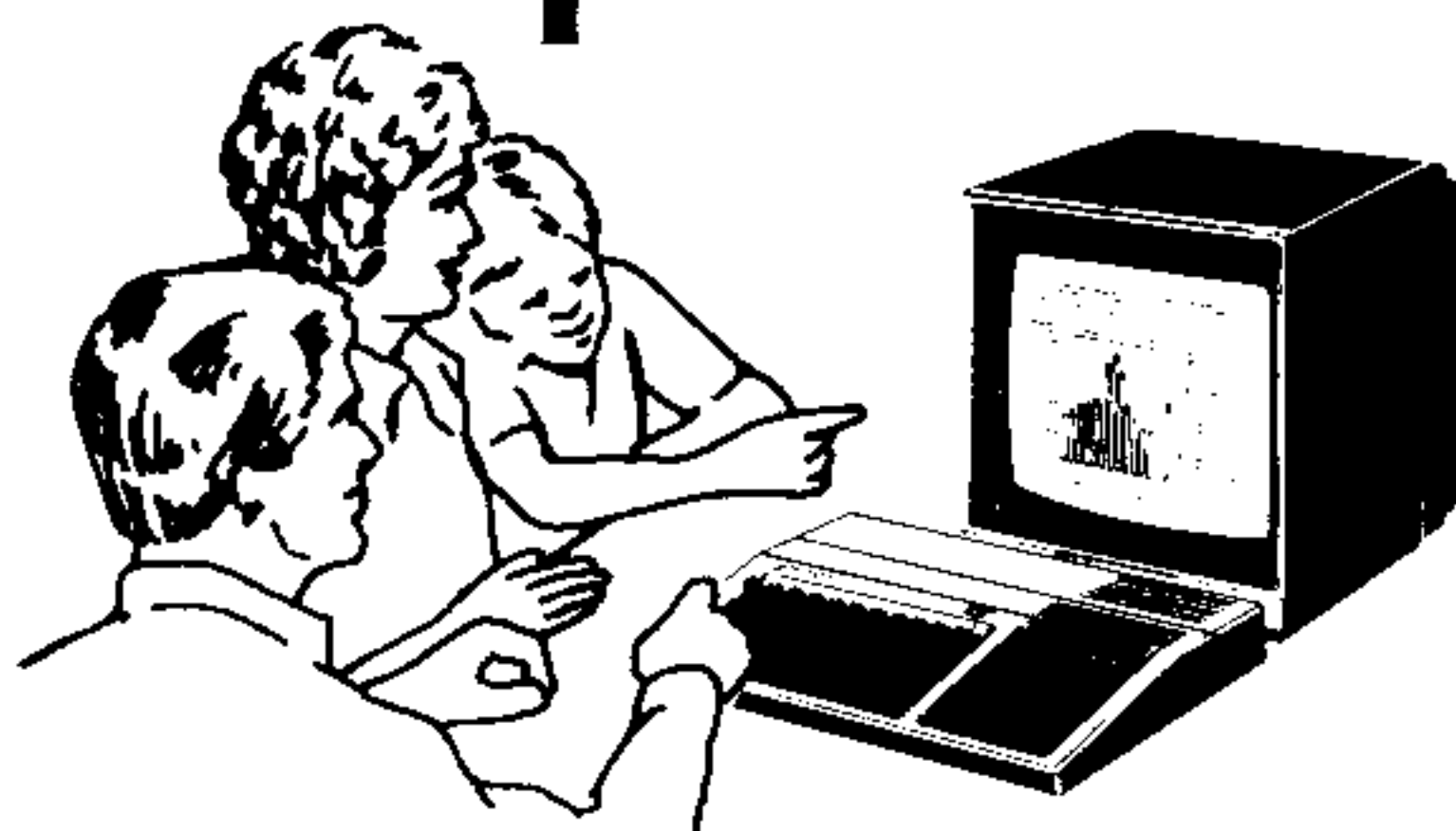
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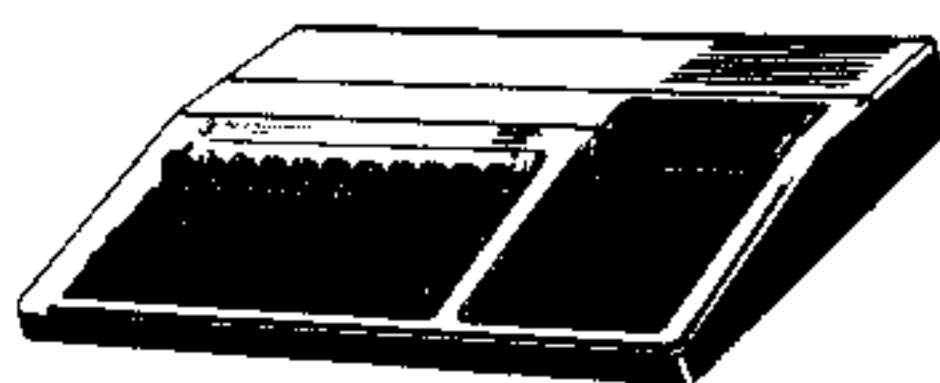
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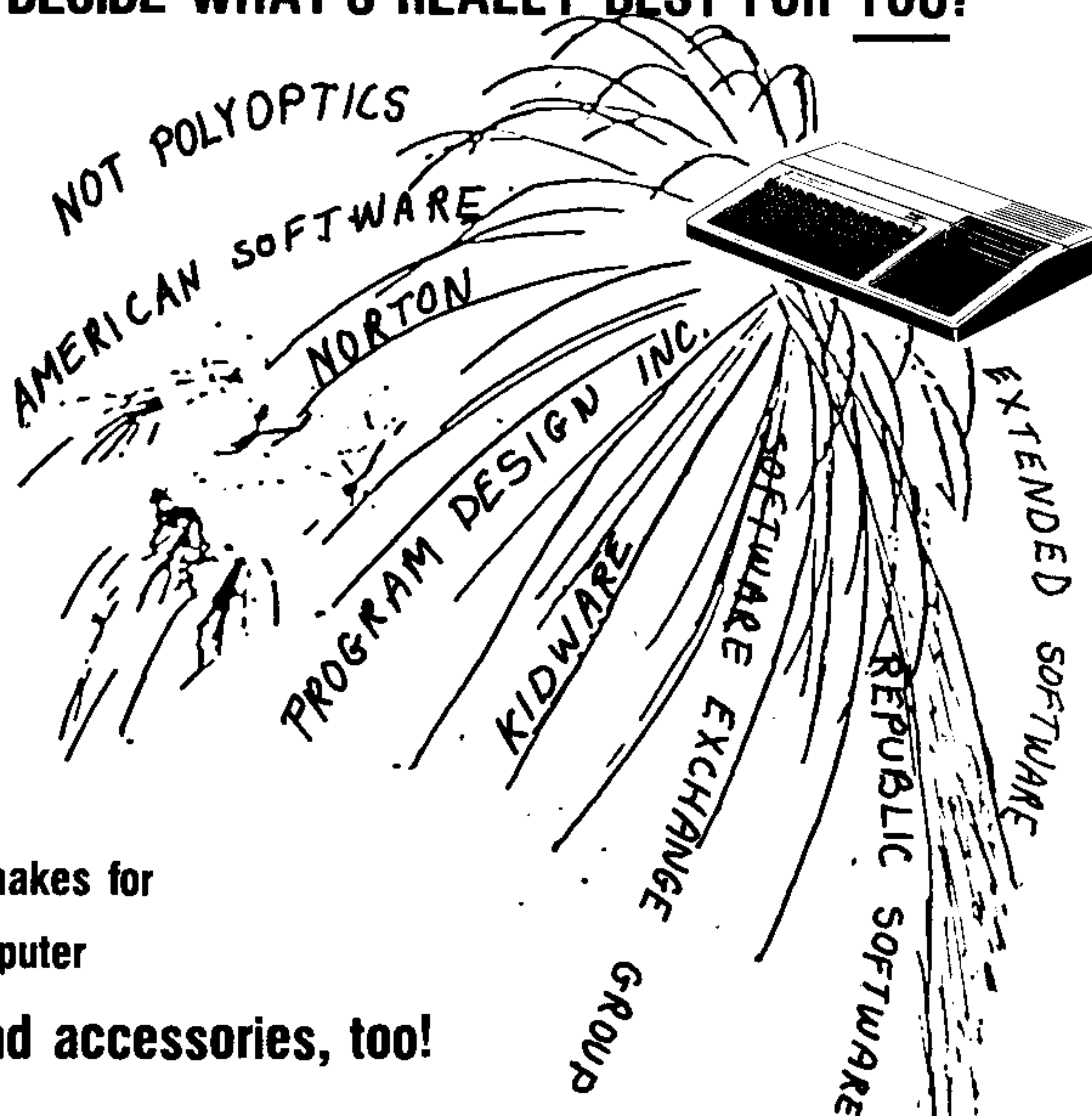
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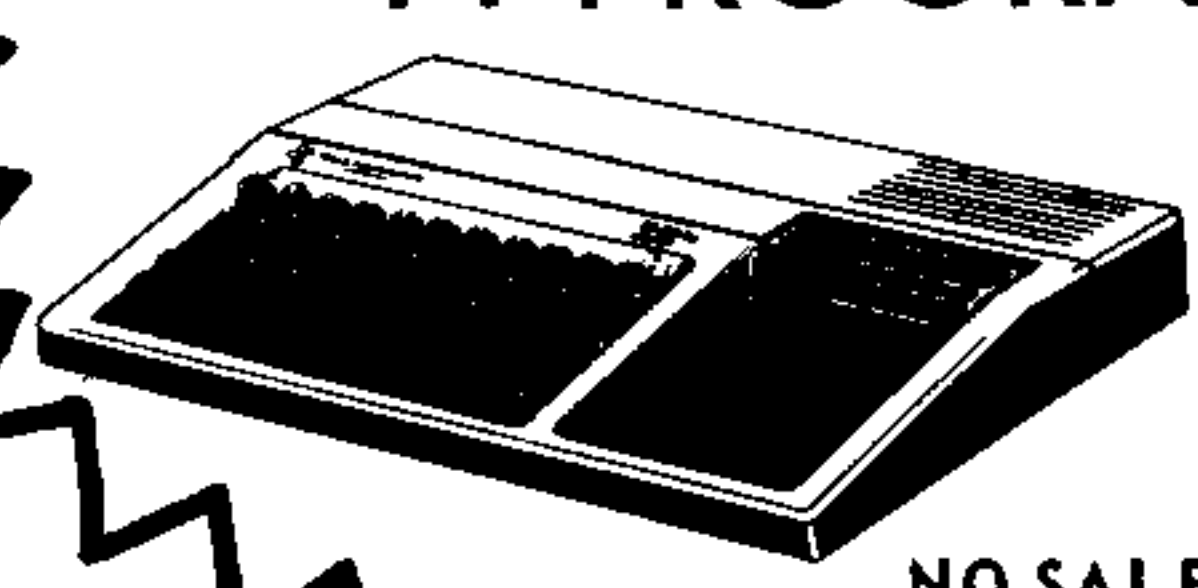


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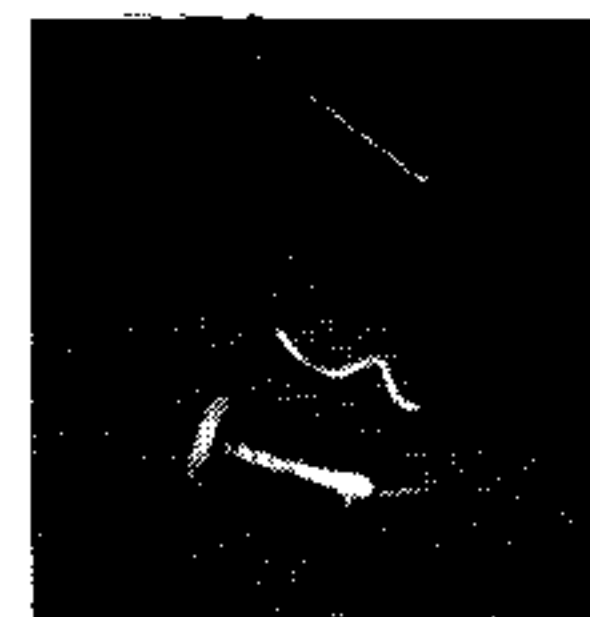
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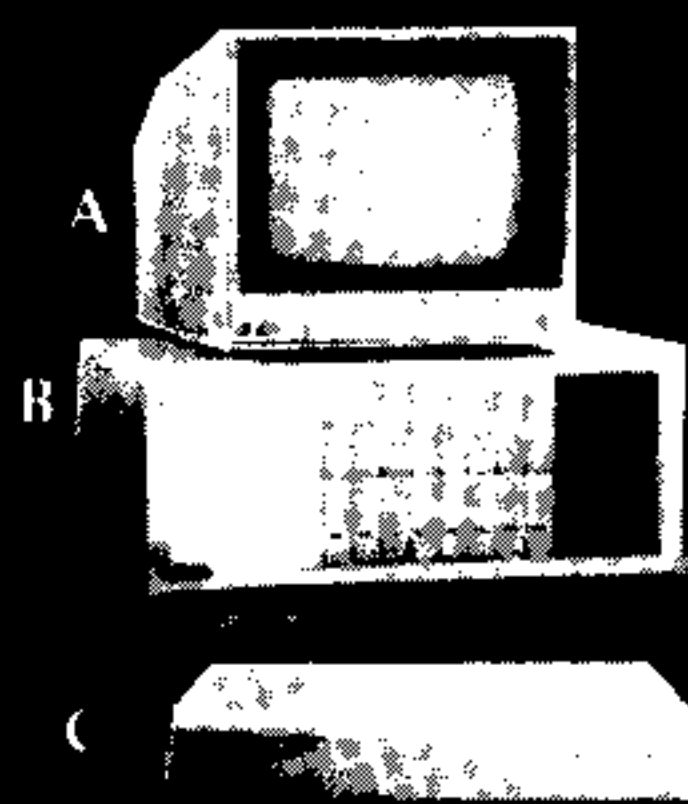


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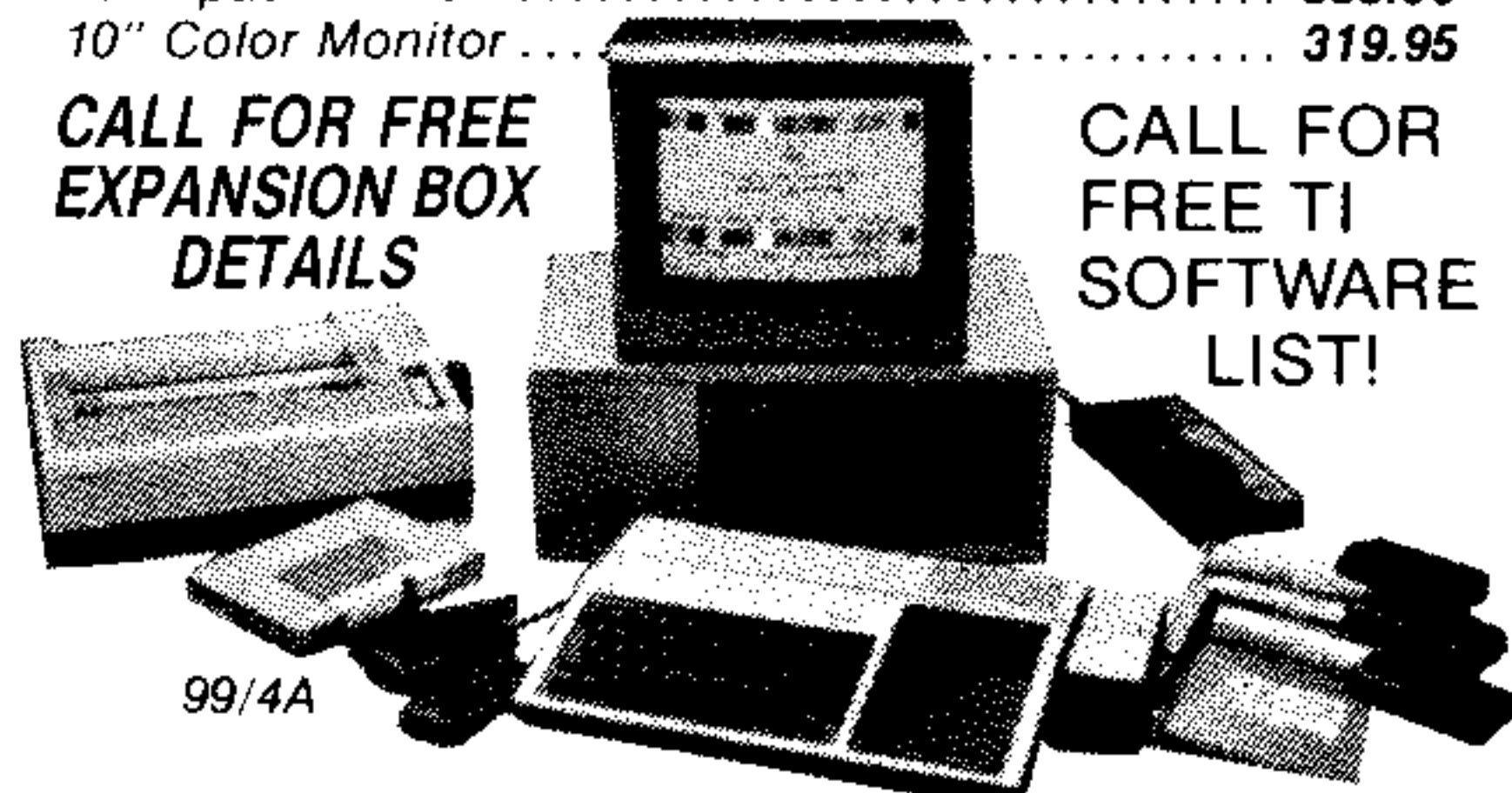
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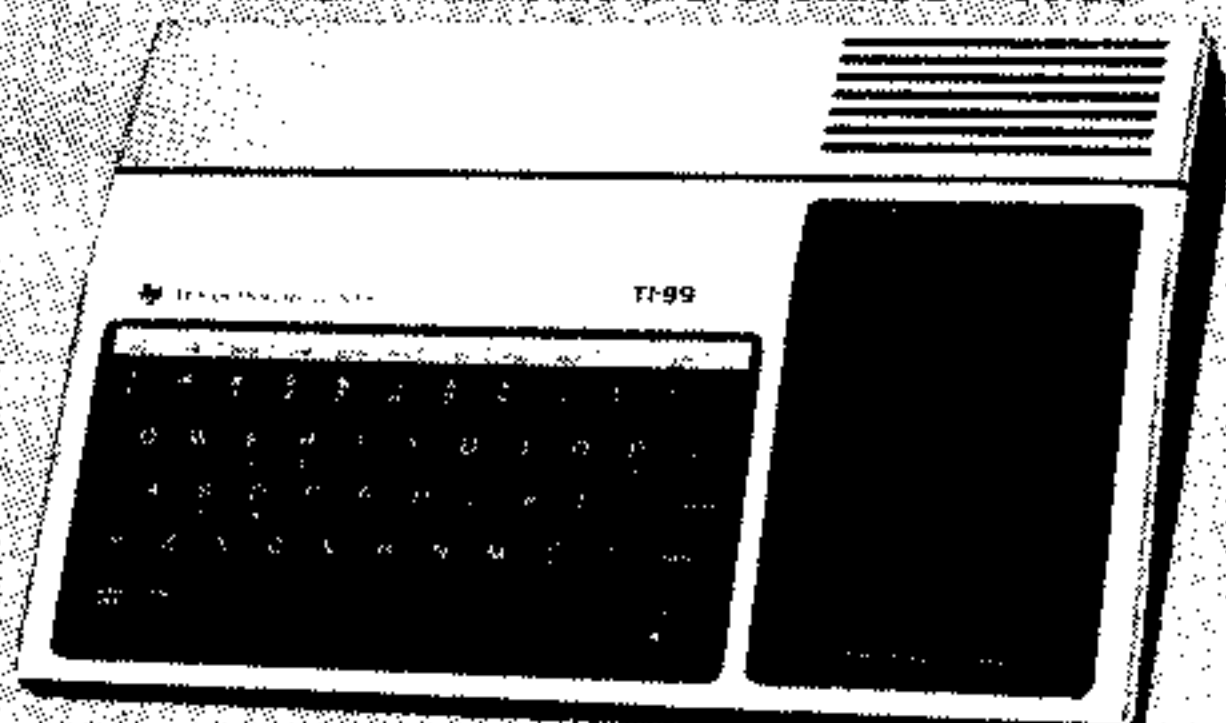
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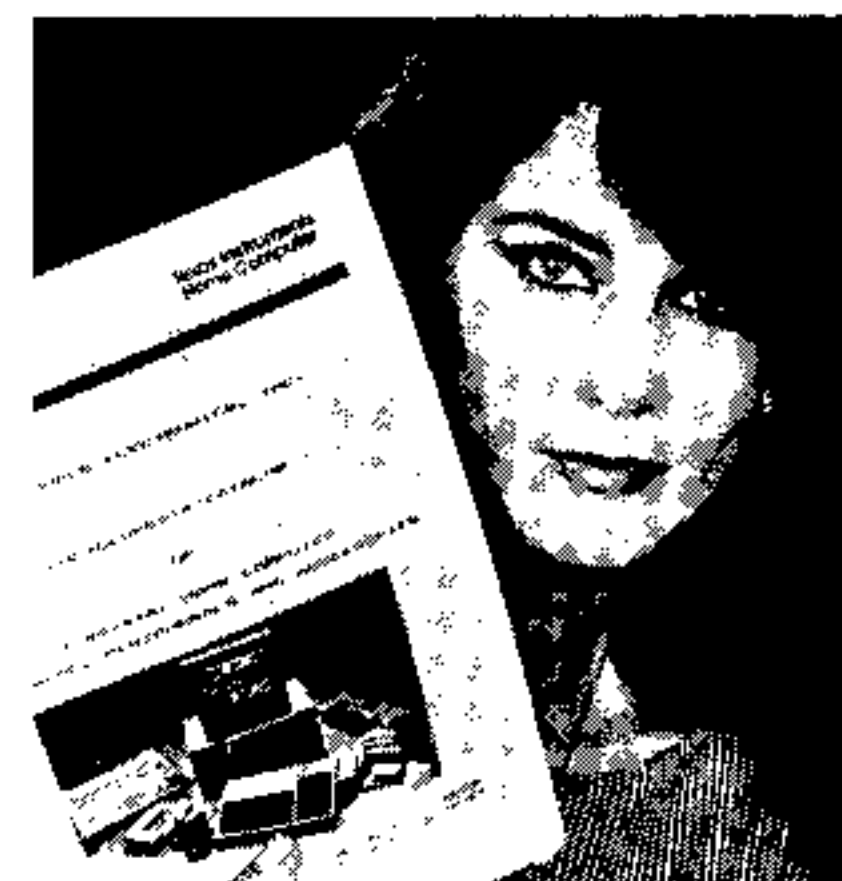
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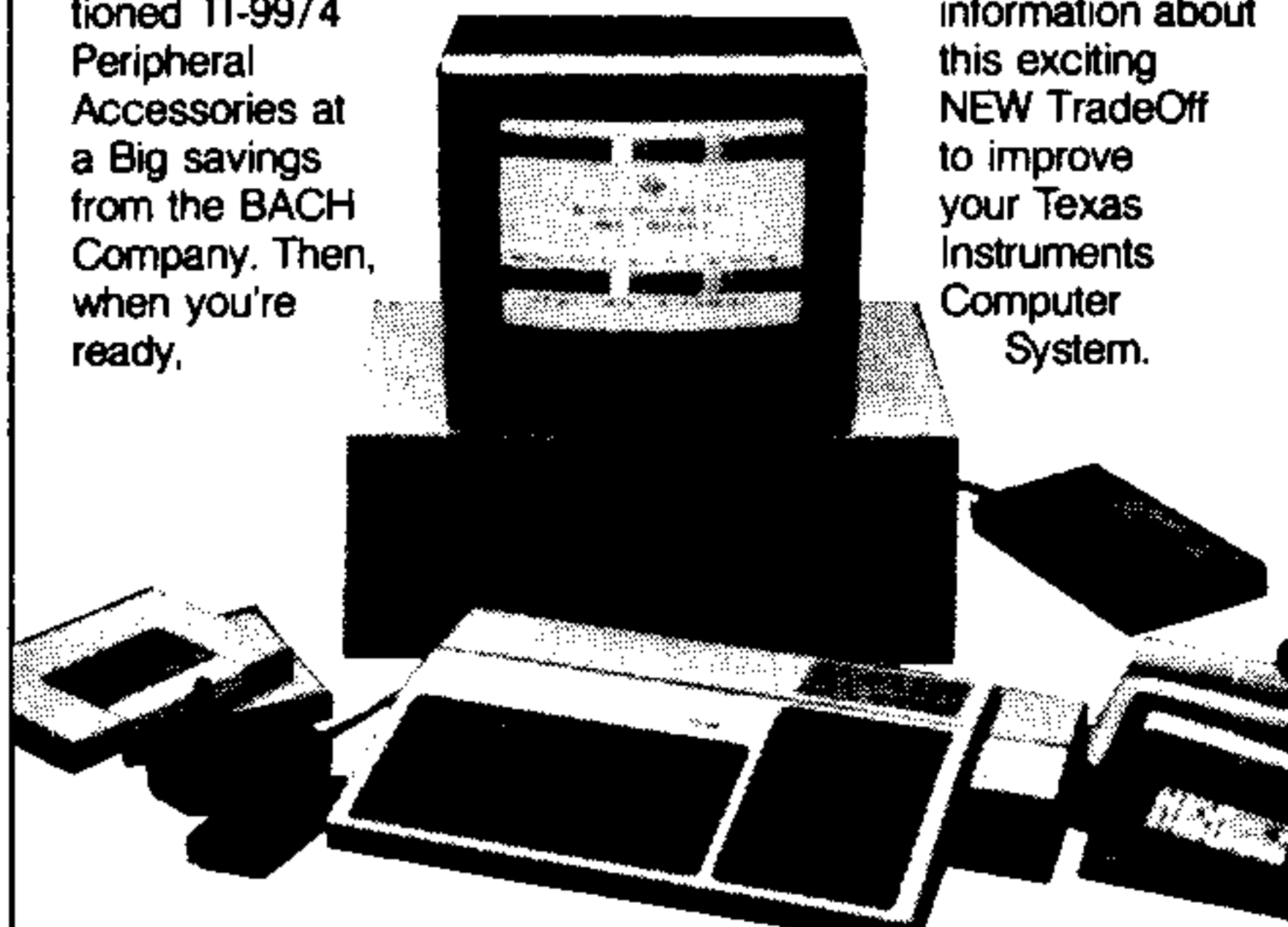
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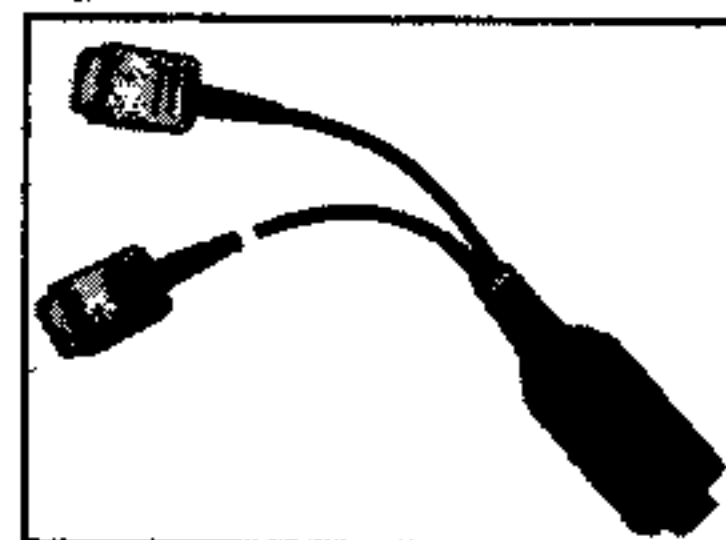
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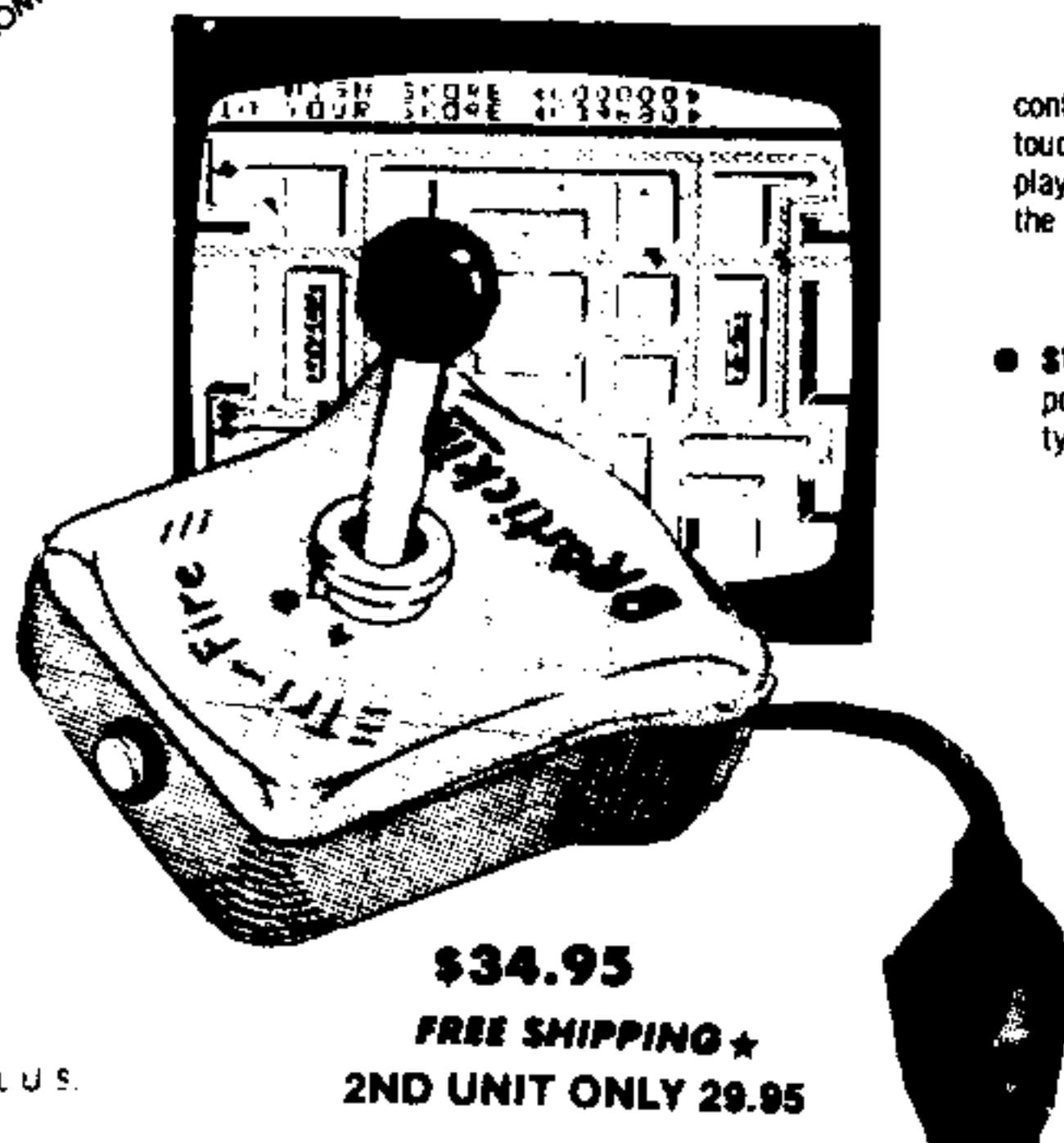


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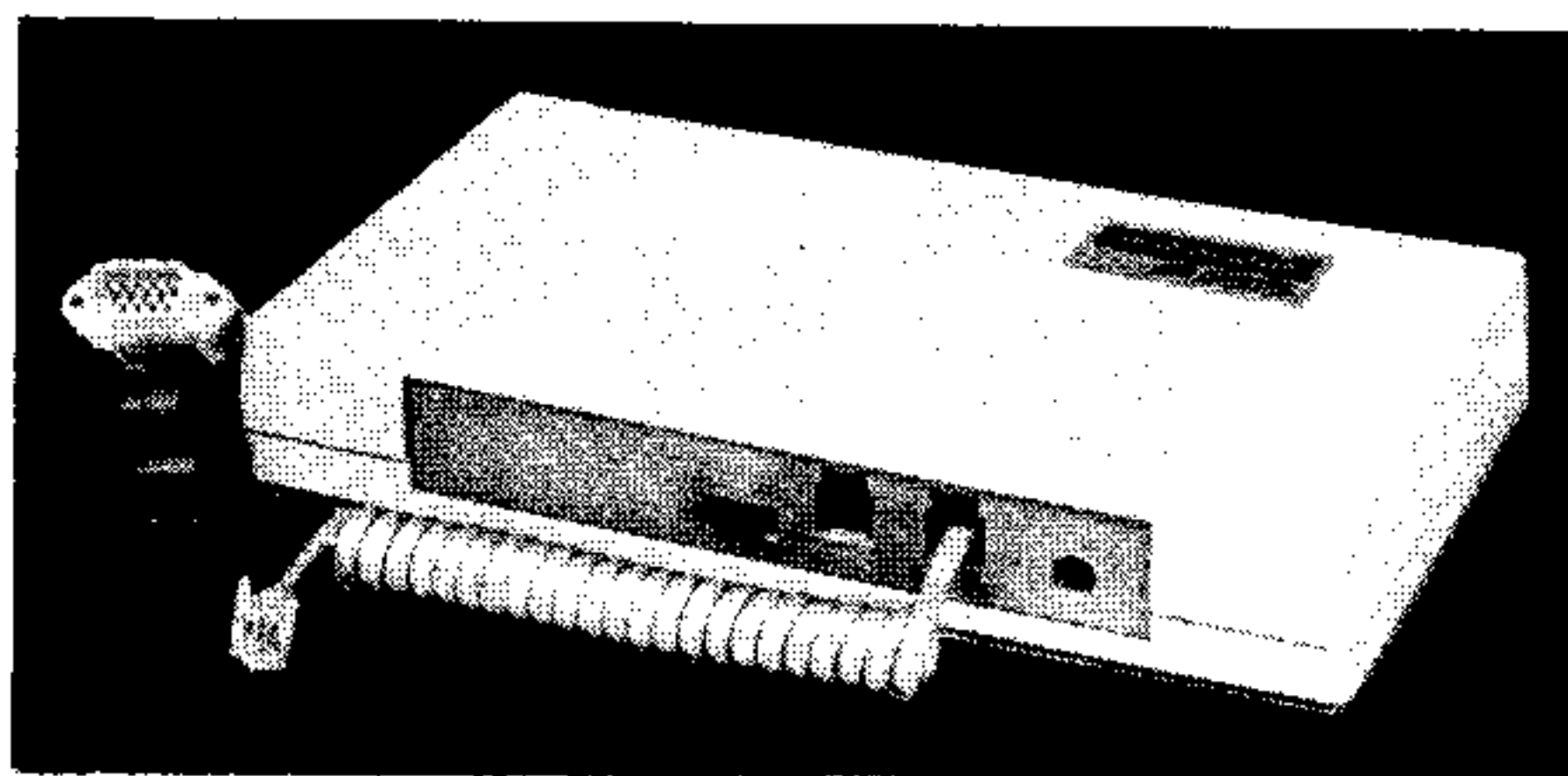
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Data Rate: 0 to 300 bps, full duplex
Modulation: Frequency shift-keyed (FSK)
Line Interface: Direct-connect
Data Interface: TI RS-232C compatible, built-in cable to computer

Transmit Frequency	MARK	ORIG	ANSW
	SPACE	1270 Hz	2225 Hz
		1070 Hz	2025 Hz

Transmit Frequency Accuracy: ±0.01%

Transmit Level	ORIG	ANSW
Receive Frequency	2225 Hz	1270 Hz
	2025 Hz	1070 Hz

Receive Frequency Tolerance: ±0.5%
Carrier Detect Threshold: -44 dBm typical
Carrier Detect Indicator: Audible tone
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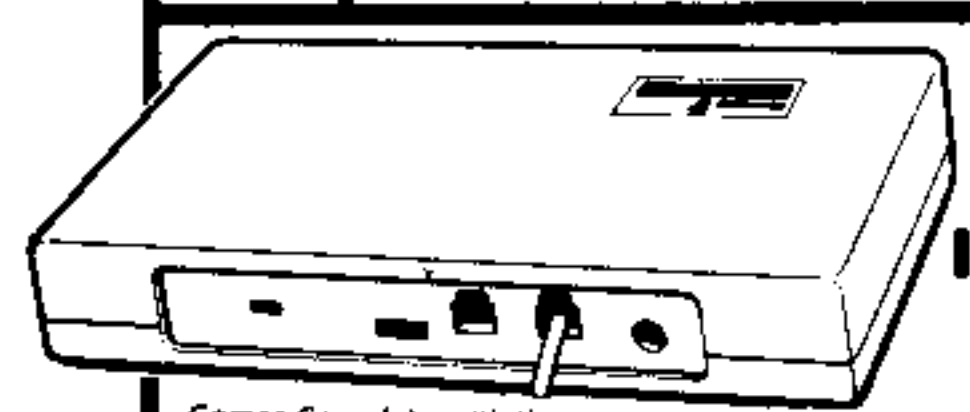
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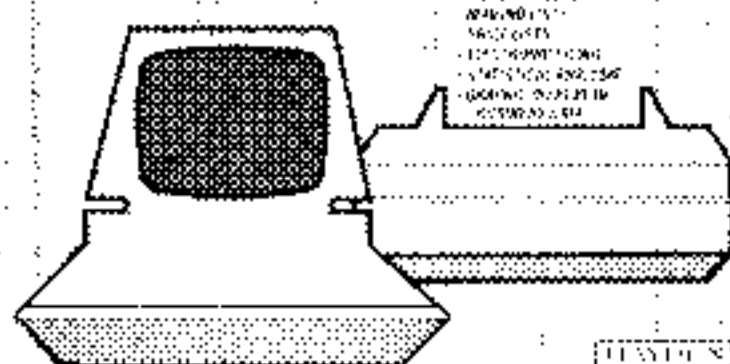
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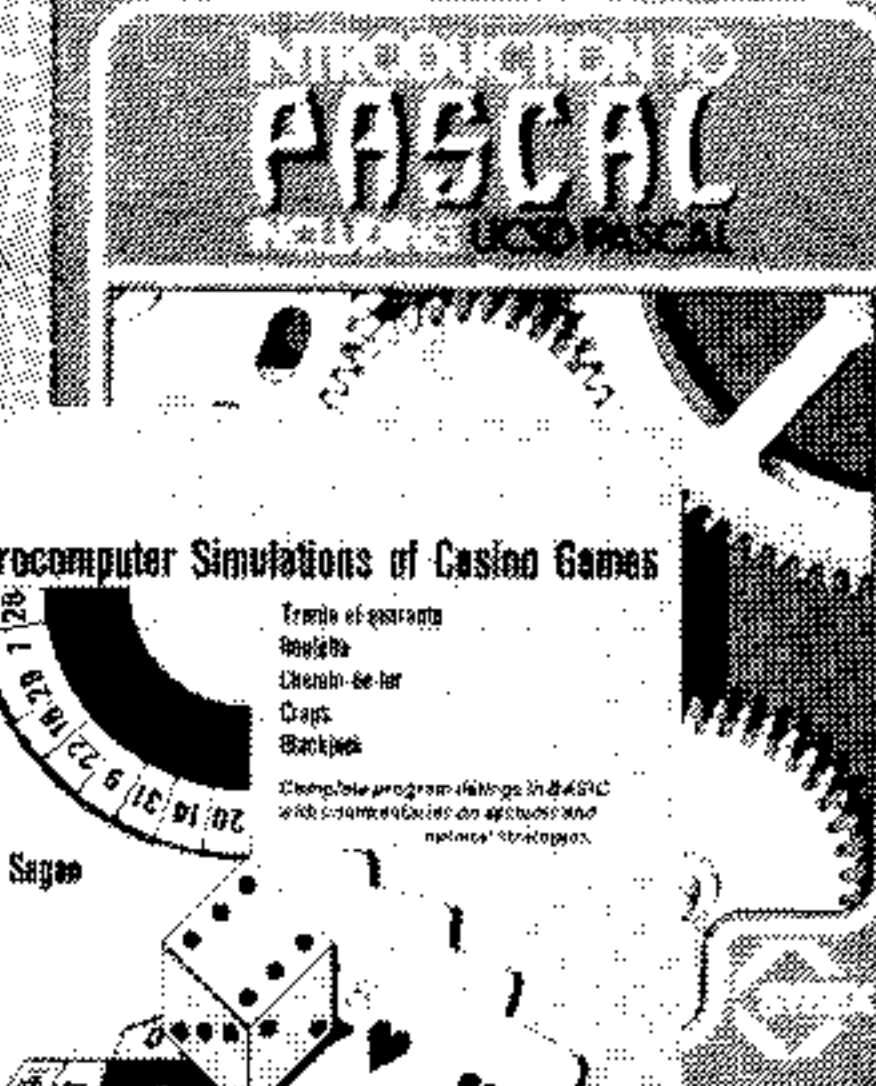
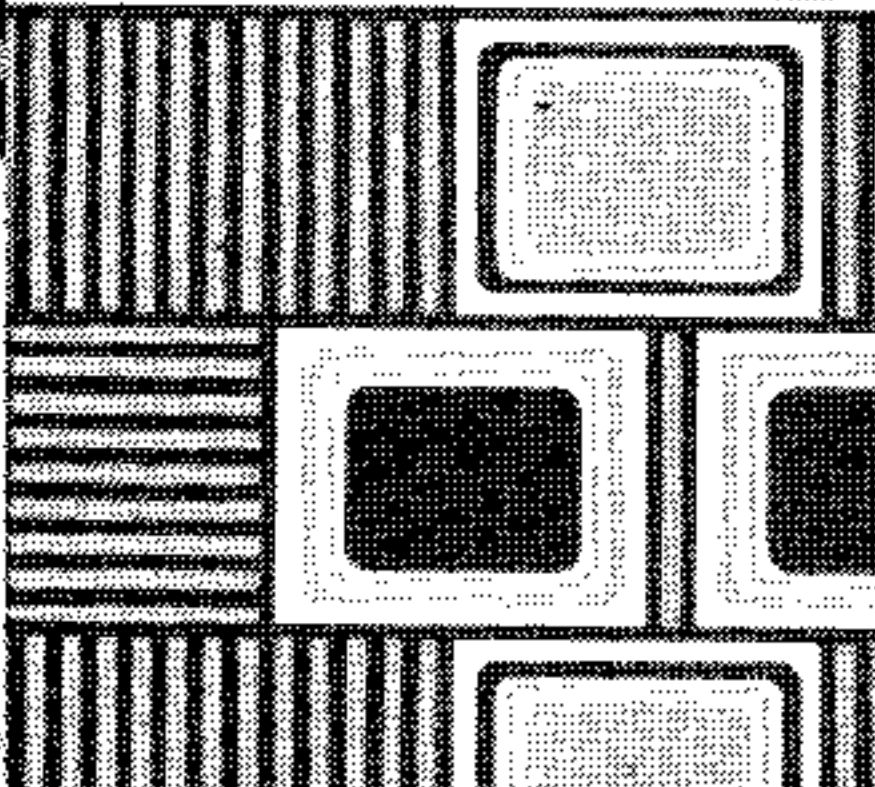
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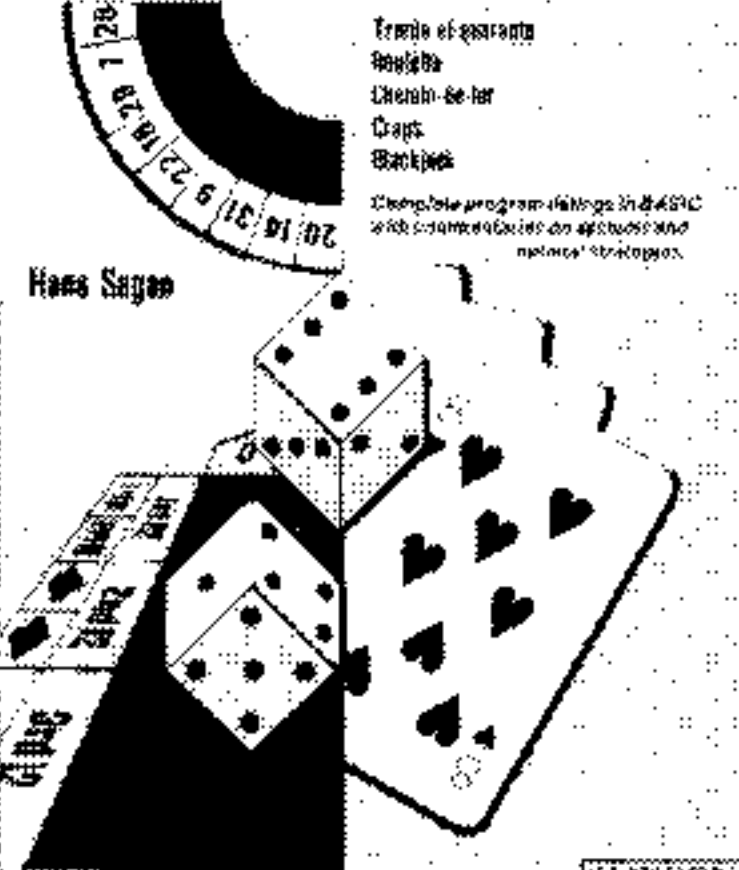
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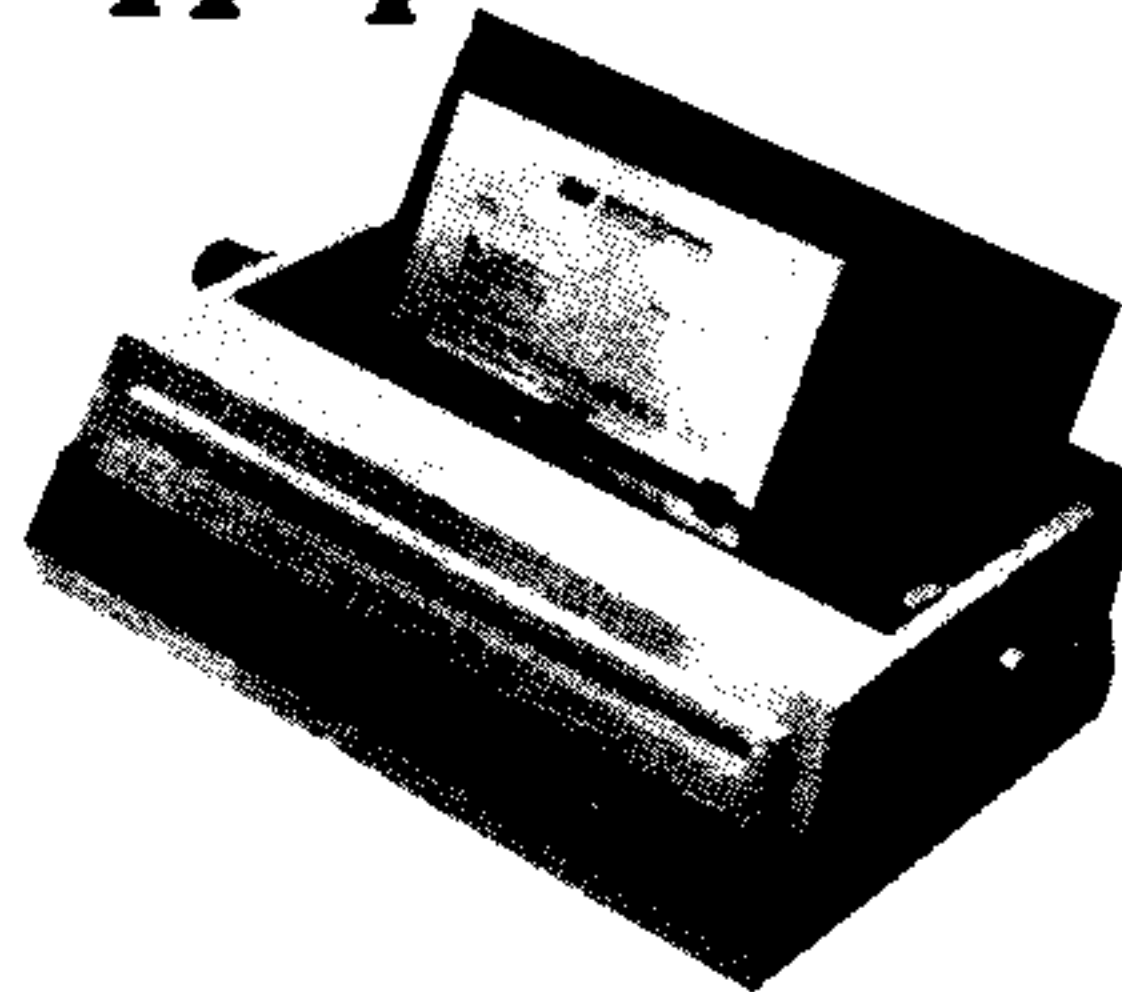


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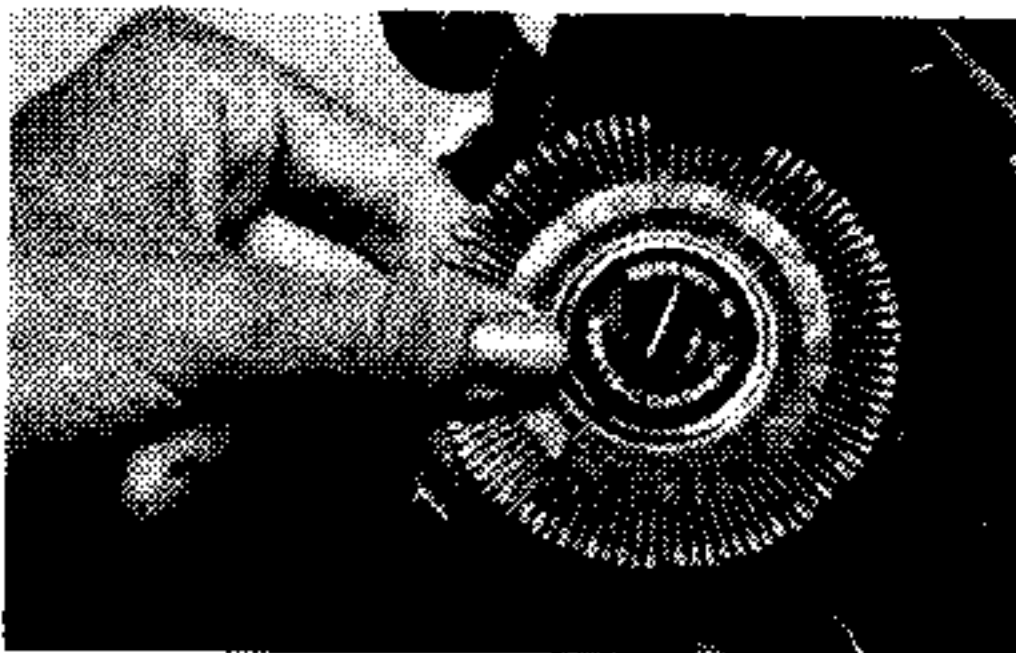
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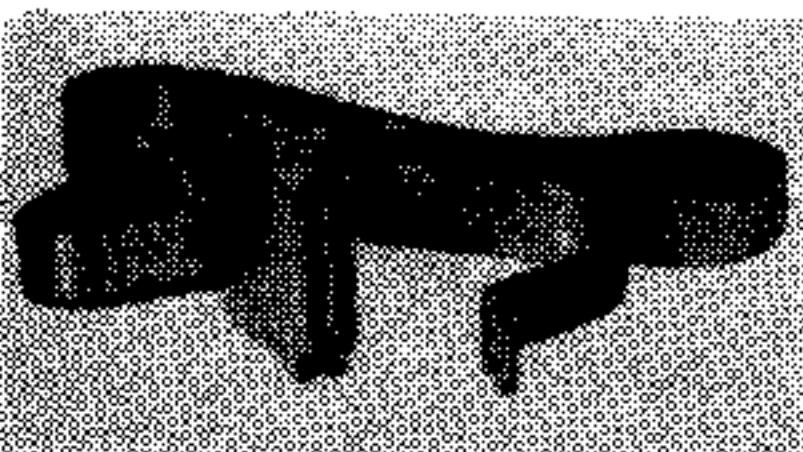
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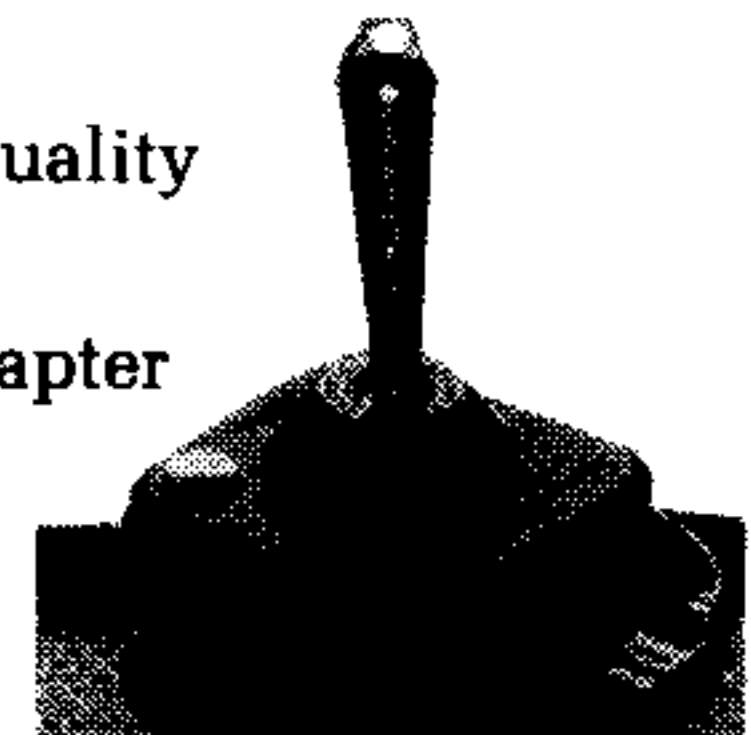


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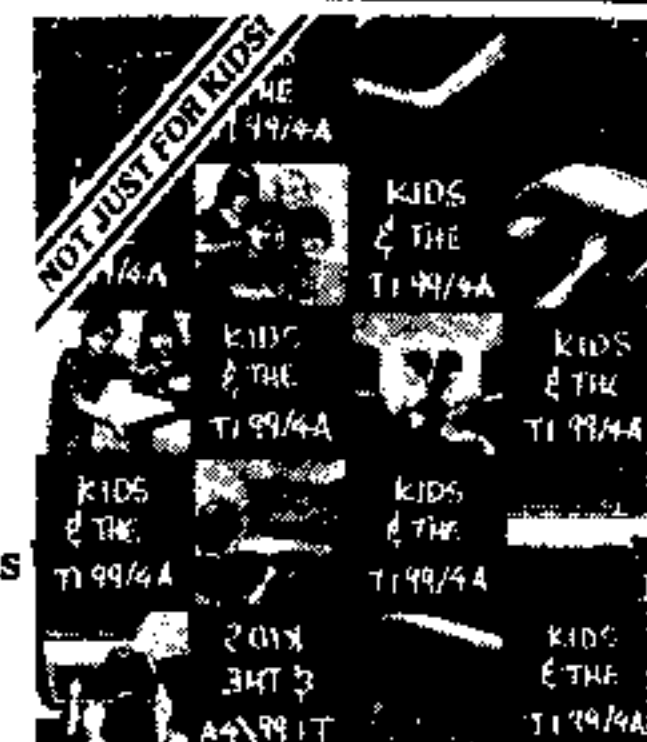
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In Part One of this article we looked at the hardware you need to run TI's Disk Operating System (DOS). In Part Two we'll talk about DOS software—the computer code itself—how it works and how you can use it for sequential and relative file housekeeping.

The Disk Operating System

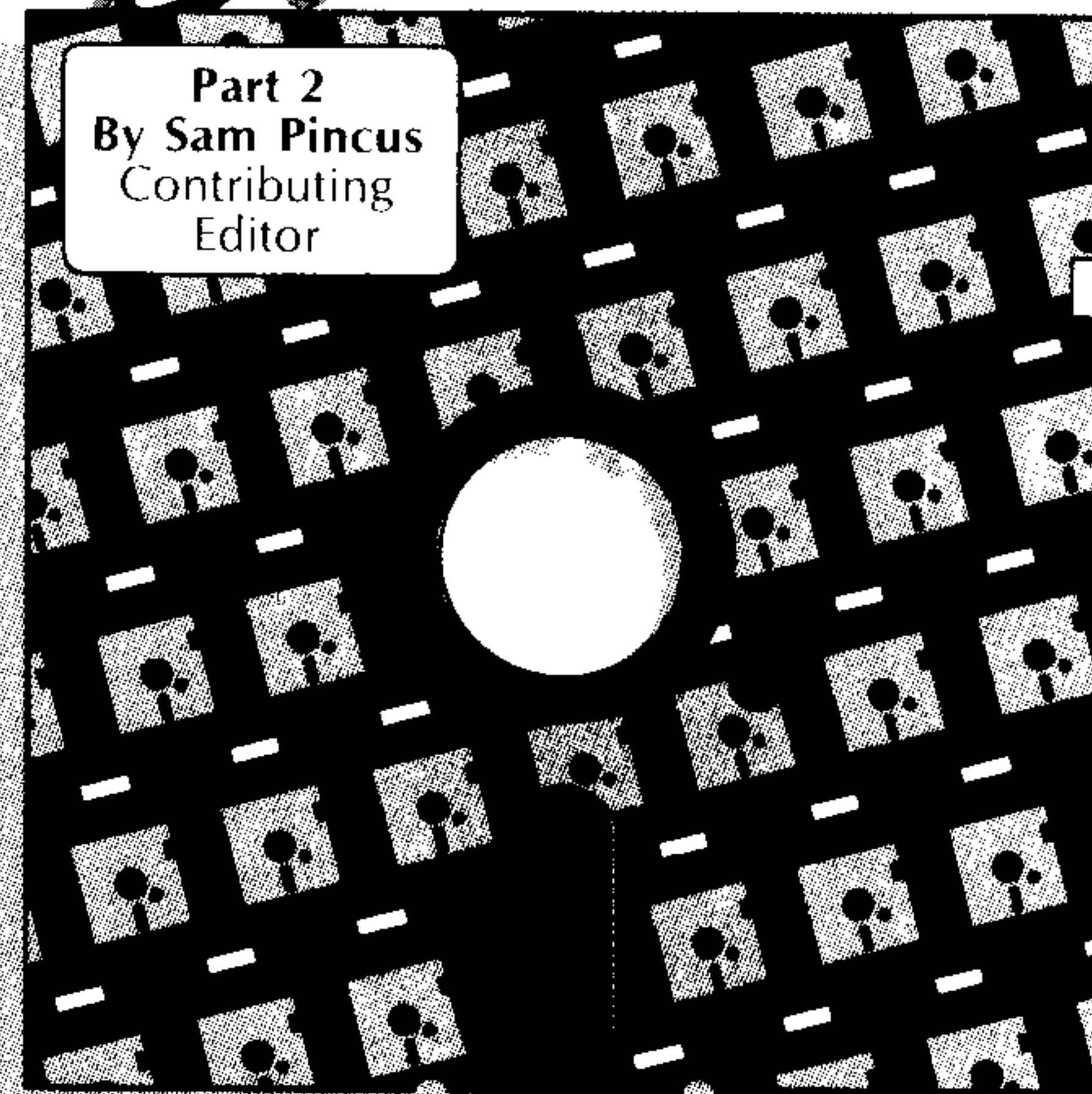
The DOS is the computer code you need to handle both disk and file housekeeping. It is the programming that makes *soft sectoring* work and manages files as part of your BASIC programs. Before we get into the details, let's go over how disk usage is organized. First of all, one major difference between tape and disk is that each disk has a permanent name. Even though you can reference a disk drive as DSK1 (similar to CS1), you can also reference a particular disk by its name. To illustrate, let's look at a disk called BASIC01. We know that it is broken up into tracks and sectors, but that is how the disk is hardware configured. What we need to find out now is how it is configured in terms of software by the DOS.

Just as you can have more than one program stored on a single magnetic tape, you can store many programs (or files) on BASIC01. The DOS reserves the first two sectors of the disk for a *directory*. This is similar to a book's table of contents. It keeps track of all the data located on the disk. There is a directory entry for each program or file located on the disk, with enough room for 128 different entries. Suppose you want the computer to get a program called *Doomcastle* from the disk. You can do it by entering OLD DSK1.DOOMCASTLE (assuming that my disk called BASIC01 is located in disk drive 1). You can also do it by entering OLD DSK.BASIC01.DOOMCASTLE (which means that I am asking the DOS to look for BASIC01 on any disk drive).

Once the DOS locates the proper disk, it searches the directory for the program. The directory entry points to the exact track and sector where the program can be found. The read/write head moves directly to that track, and as soon as it gets to the proper sector in the track, it starts reading. This is one reason why disk access is so much faster than tape cassettes. The disk does not need human intervention to turn it on or rewind it, and it doesn't have to read through a lot of unnecessary data before it gets to the place where the information you want is stored. In addition, a disk drive is capable of reading this data and passing it on to the controller (and from there into the computer) about 100 times faster than a tape recorder can.

Drive for Diskettes

Part 2
By Sam Pincus
Contributing
Editor



If you want to write out a sector of information to BASIC01, the DOS follows the same procedure: First, it locates the disk; then it finds the first available track on the disk (also from the directory). Finally, the read/write head moves to that area, and the disk drive starts writing out the data. And, after the data is written out, it is automatically reread and immediately verified. That's a handy feature of writing data to a disk: no need to rewind and do a separate verification as in tape!

Full Sector Blocking

In order to minimize disk reads and disk writes, the DOS takes 2K of RAM away from your 99/4A and uses them for *buffers* (one for each file). When you write data to a part of a sector, it is really written to a buffer in RAM. Only when the information for an entire sector is ready, does the DOS actually write out to the disk. Likewise, a buffer in RAM will hold the entire contents of a sector when you want to read data from it. Then, if you want to read more data from the same sector, the DOS gives you the data from the buffer without having to reread from the disk. This technique is called *full sector blocking*, meaning that the operating system always processes programs or data one sector at a time.

If the data uses more the 255 bytes (as does our example program, *Doomcastle*),

it must be read or written a sector at a time. If the information uses less than a full sector, you must be sure to CLOSE your data file or type BYE before leaving the program. Then the unused bytes in the sector will be filled with zero bits, and the DOS will understand that it is to write out the data to the disk even if the buffer is not filled a full sector's worth. No other data file will be able to use that sector.

Two Parts of the DOS

The TI-99/4A's DOS has two major components: the *Disk Manager* Command Cartridge (which comes free with each disk controller) and the code inside your TI-99/4A console. The *Disk Manager*, which contains the program code for all of the housekeeping functions not needed to run a program, performs several jobs. It will initialize a disk by establishing the sectors on each track and filling them with an initialized pattern (there's that "soft-sectoring" again!). It can also copy files between disks for backup, name or rename a disk or file, delete (remove) files or programs from a disk, and print the contents of the disk directory. In addition, it gives you the means to set a *deletion protect* switch which prevents you from accidentally deleting or

replacing a file or program. This is a neat function seldom found on microcomputers. The functions and operations of the *Disk Manager* are spelled out in detail in the manual that comes with the disk controller. The manual also outlines how to set up the controller and your TI disk drives, initialize disks and name them, and how the various housekeeping functions operate. It also provides a good background on file- and disk-naming conventions. I won't repeat that information here, but I will say that as in most TI manuals, the information is straightforward and it includes enough examples to give you a good idea of how things work.

The second major DOS component, the code, allows you to load and save programs and read and write data files as part of BASIC programs. I'm not going to go into all the features of this part of the DOS. Instead, I will spend the rest of the article describing how the disk files work.

Files and Data

A file is a grouping of data stored outside the computer. It is composed of one or more individual groups of data called records. The easiest way to explain this is to give an example. Suppose that I am the secretary of a bowling league and want to maintain a scoring history for every bowler in the league. A file would be made up of

Continued on p. 46

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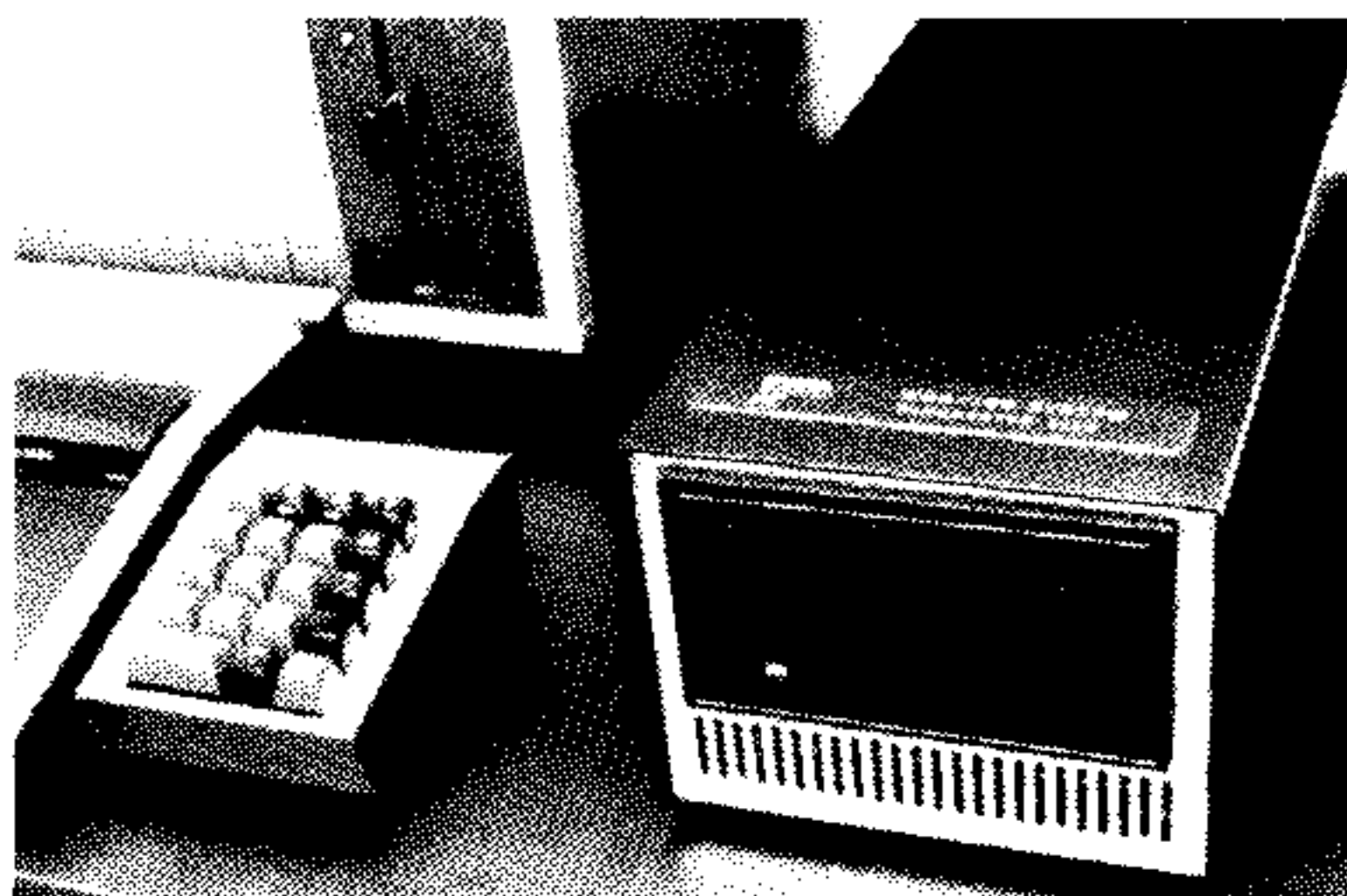
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records which hold information about each individual bowler. If there were 60 bowlers in the league, I would need 60 records in the one file. Each file has a name, and we will call this file *Bowlers*.

File data used in BASIC programs can be stored in either DISPLAY or INTERNAL format. DISPLAY stores data exactly the way it would look on a monitor or in DATA statements. All letters and numbers are stored as individual characters. In order for our program to perform operations with this data, the computer will first have to convert it to INTERNAL format. For this reason, we are better off saving all data in INTERNAL format to begin with. All numbers in INTERNAL format will take exactly 8 bytes no matter how large they are. This may help us estimate how big each record that holds the data will be. In all my programs, I use only INTERNAL format data.

Having made that decision, we tell the DOS in the OPEN statement what kind of file we are going to use and what option we'd like for processing the files. Depending on how we want to store and retrieve our records, we will tell the DOS to file our bowlers' information in either *sequential* or *relative* data files.

Sequential Data Files

These are individual records stored on the disk one after the other, in the same order in which they were written. For example, the first record in *Bowlers* would contain the data written to the disk for the first bowling league member; the second record written to the disk would contain the data of the second member, and so on.

These sequential files can be either *fixed length* or *variable length* record files. A fixed length record file is identical to the files stored on cassettes. Each record is the same length, which can be anywhere from 2 characters (bytes) to 255 characters (a full sector) long.

In a variable length file each record may have a different length up to a maximum amount. For example, suppose a part of each record in *Bowlers* was to contain the member's name. With fixed length records, we would have to make sure that we truncated any names that were too long to fit in the record. On the other hand, if someone's name were short (and therefore smaller than the fixed length), the DOS would have to pad the name part of the record with zero bits so that it would be the right length. In a variable length file, we would not have to worry about any of this. We would tell the DOS the *maximum* size that the variable length record would be and let the computer do the rest. Variable length records can be up to 254 characters long, which means that we can set the maximum length high enough to accommodate any name. This way, if a name is short, we do not waste disk space with padded information. Variable length records are very efficient at storing data strings, such as people's names. The only disadvantage is that variable length record files use up one byte per record, which makes the maximum length of a record 254 bytes.

The major drawback of a sequential file is that even though the file is located on a disk in a drive that can jump from track to track, it is often a case of "you can't get there from here." In this regard, it is just like a cassette tape file. Whenever data is read from this kind of file or written to it, the entire file (that is, all the records) in front of the one we want must be read or written. So it is not possible to go from record 242 to record 241. Instead, the system goes back to record 1 and reads all the way to 241. To read from a sequential fixed length file, we would OPEN the file in the INPUT mode. To write out to the file, we would OPEN it as OUTPUT.

Because the sequential variable length file is stored on a disk, there are some things we can do with it that are just not possible with cassette tape files. For exam-

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ple, we can tell the DOS that we want to add new records to a file and that we don't want to read in all the previous data first. In this case, we can OPEN the file in what is called APPEND mode so that we will automatically add new records to the back of the file. We cannot do this with cassette tape files!

The EOF function is another neat feature provided by TI's DOS for sequential files. This allows us to see if we have run out of data on a sequential file while we are reading it in. Trying to read past the last record on a file will generate an error. This means that we do not have to keep a special record count to make sure that we don't try to read in too many records.

Because the data on input is saved in the buffer, we can both read and write at the same time. We do this by OPENing the file in UPDATE Mode. Using this feature is very tricky because we cannot tell the DOS which record we want written out. If we have just read in the 15th record, changed its data and then want to write it to the disk, we have to be careful. Telling the DOS to write it out now *won't* cause the new data to write to the 15th record. For this reason, I'd never use this method.

Let's review what we know about sequential file processing. First, the file can be composed of either fixed length records or variable length records. Second, fixed length record files are just like cassette files except that they can be a maximum of 255 characters long. These files can be OPENed as either INPUT only or OUTPUT only. Variable length record files have a length of 254 bytes and can be OPENed as INPUT, OUTPUT or in APPEND mode. Third, using the EOF statement will protect you from reading past the last record on the file. Finally, you can try a tricky technique to both read and write a sequential file by OPENing it in UPDATE mode.

We will now go over an example of what the sequential disk file program code

would look like by recoding the bowling league program.

```

90 REM ROOM FOR 60 BOWLERS
   NAMES, AVERAGES, HANDI
   CAPS.
100 DIM B_NAMES$(60),B_AVG(60),
   B_HANDI(60)
999 REM OPEN FOR OUTPUT
1000 OPEN #25:"DSK1.BOWLERS",
   OUTPUT,INTERNAL,SEQUEN
   TIAL,VARIABLE 254
1010 FOR I=1 TO 60
1020 PRINT #25:B_NAMES(I);B_
   AVG(I);B_HANDI(I)
1030 NEXT I
1040 CLOSE #25
1099 REM OPEN FOR INPUT
1100 OPEN #20:"DSK1.BOWLERS",
   INPUT,INTERNAL,SEQUEN
   TIAL,VARIABLE 254
1110 I=1
1120 INPUT #20:B_NAMES(I);B_
   AVE(I);B_HANDI(I)
1130 IF EOF(20)=0 THEN 1140 ELSE
   1160
1140 I=I+1
1150 GOTO 1120
1160 CLOSE #20

```

Statement 1100 opens the file called BOWLERS located on any disk found on drive 1 for input. Statement 1000 opens it for output. Since the file already exists on the drive, this new version will be written over the earlier version already on the disk. Note that by letting the DOS do the blocking, we have significantly decreased the amount of work we have to do on output (compared with what is required for tape files). Also notice that I use variable length records to minimize wasted disk space when a bowler has a short name. Another thing to notice is that on input, I use file #20 for BOWLERS, but for output I use file #25 for the very same file. I do this to emphasize that once a file has been CLOSEd, you can reopen it with any available file number. *The only rule to*

Continued on p. 49

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Diskettes . . . from p. 47

remember is that you can't use the same file number for two different files that are open at the same time!

Relative (Random) Data Files

One of the most powerful features of the DOS is its ability to handle the second kind of file that can be stored on a disk, the *relative* or *random* file. These files are composed of fixed length records which the DOS can locate directly. The DOS does *not* have to read past a previous record in order to get to the one we want. It can calculate the exact track, sector, and location within a sector merely by looking at the record number we want to retrieve. With this kind of file, the 15th record written out can be placed on the first record of the file, the 4th record written out can be placed on the 3rd record of the file, and so on. This kind of file processing is very useful when we want to update particular records in a very large file. We don't want to waste our time reading the data that doesn't change. For example, suppose that our bowling file contained data on 500 bowlers but only 30 of them bowl on a particular day. Why waste time reading in records on all 500 members when all we want to do is to update 30 records? You can see that this type of file can give us tremendous power.

Because the only limitation on relative record files is that they be fixed length, there is nothing to prevent us from creating this file sequentially in one program and updating it as a relative file in another! If we are just going to read the various records on the file, we can OPEN the file as INPUT. Similarly, if we are creating the file and are not going to be reading any records, we can OPEN it as OUTPUT. However, if we are going to be updating individual records, we indicate this to the DOS by OPENing the file in UPDATE mode. Every time we want to read or write a record, no matter how it was opened, we give the record number as part of the READ or PRINT statement. Without a

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record number, the DOS will get the next available record for reading or writing. Suppose that I last read in record 15 using the REC part of the read statement. If I follow that with a regular read (no REC included), my program will wind up reading record 16.

Let's review what we have discussed about relative record files. First, they must contain only fixed length records, and any fixed length record file can be treated as a relative file. Second, they can be OPENed for INPUT only, OUTPUT only, or in UPDATE mode. Third, in order to use any mode, we must give the record number as part of the READ or PRINT statement. Fourth, if we don't provide a record number, the next record in line will be read or written.

Suppose that we want to update our bowlers' pin averages after every frame. We first change our original example program to create a file using fixed length records only. For this example, let's make all records 250 bytes long. Then we give each bowler a number representing his record number; that is, the first bowler on our file has record number 1, the second has record number 2 and so on. We then write a program that would look something like this:

```

99 REM OPEN FOR UPDATE
100 OPEN #15:"DSK.BASIC01.
    BOWLERS",UPDATE,INTER-
    NAL,RELATIVE,FIXED 250
200 REM MAINLINE
210 INPUT "ENTER BOWLER'S #":I
220 IF I<1 OR I>60 OR I<>INT(I)
    THEN 210
230 INPUT #15, REC I:B__NAMES;B__
    AVGS;B__HANDI
240 PRINT "ENTER NEW AVERAGE
    FOR ";B__NAMES
250 INPUT B__AVG
260 . . . . . [compute handicap here]
270 PRINT #15,REC I:B__NAMES;B__
    AVG;B__HANDI
280 GOTO 210
  
```

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We are proud to induct the following gamers into the 99'er Hall of Fame. Each of these June champions is under 18 years old! We are pleased to be able to send each of them one of our new Hall of Fame Certificates. Congratulations to:

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Game: **Parsec**

Score: **1,250,000**

Name: **Joel Morgan** (Warner Robins, GA)

Game: **Chisholm Trail**

Score: **603,400**

Name: **Heidi L. Hinds, 15** (Ballwin, MO)

Game: **Tombstone City**

Score: **208,100**

Name: **Greg Ostrander, 8** (Kirkland, WA)

Game: **TI Invaders**

Score: **23,132**

Name: **Jeff Barna, 12** (Butler, NJ)

Game: **Henhouse**

Score: **64,840**

Name: **Brian Klamik, 6** (Riverside, IL)

Game: **Car Wars**

Score: **25,610**

Name: **Todd Miller, 13** (Racine, WI)

Game: **Munchman**

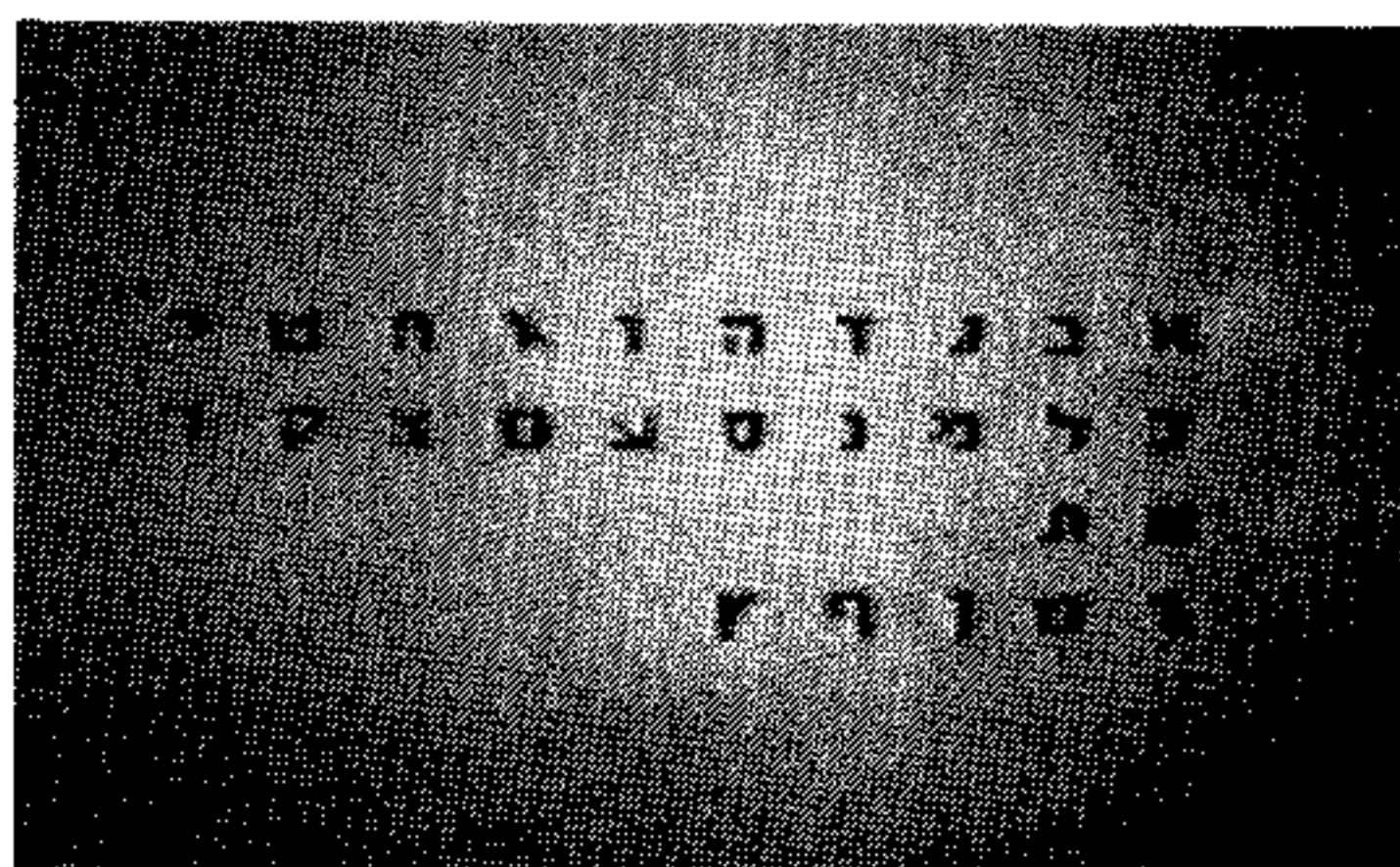
Score: **225,060**

Name: **David Sollohub, 7** (Plano, TX)

Game: **Munchman**

Score: **134,560**

Potpourri



Dear Potpourri Editor,

I am a beginning student of Hebrew. I decided to program my 99:4A to display "flash cards." My program includes a vocabulary of Hebrew words, phrases, and sentences, as well as their English translations.

One of the Hebrew items is selected randomly and displayed on the screen. Then I type in the English equivalent. If it's correct, the screen is erased and another flash card is presented. If my response is wrong, then the program displays the correct English translation beneath my own input line. In this case, I can study the display as long as I want to—another flash card won't appear until I signal that I'm ready by hitting a key.

Although the flash card idea is simple, the programming got a little tricky because Hebrew has different alphabetic characters than English and is written from right to left.

The next thing I want to do, which is even trickier, is to have the program display English while I respond in Hebrew.

Shalom,
Barbara E. Steinberg
Altadena, CA

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Diskettes ... from p. 49

999 CLOSE #15

We open a relative file called *Bowlers* located on a disk called BASIC01, using the UPDATE mode. Then we ask for the bowler's record number. We edit this number to make sure that it is legal, and then in lines 230 and 270 we include the number as part of our READ and PRINT statements.

We have gone through a very broad discussion about disks, disk drives, and disk files. I hope you found it both interesting and instructive. I also hope that it will make you feel so confident about using disks that you'll want to join the drive for diskettes!

**PLEASE DON'T FORGET TO
RETURN THE QUESTIONNAIRE
ON THE FRONT BIND-IN CARD.**

Tuning Fork ... from p. 13

```
250 REM *FRETS*
300 CALL CHAR(92,"000000FFFF000000")
310 REM *GUITAR LOGO*
320 CALL CHAR(144,"3C7EFFDFDEDEDF")
330 CALL CHAR(145,"3C7EFFFF7F7FFFF")
340 CALL CHAR(146,"7E3C000000000000")
350 CALL CHAR(147,"7E3C000000000000")
360 CALL CHAR(148,"0000000055550000")
370 CALL CHAR(149,"0000002B78782B00")
380 CALL CLEAR
390 PRINT TAB(7);"TUNE YOUR GUITAR"
400 FOR I=1 TO 10
410 PRINT
420 NEXT I
430 CALL HCHAR(15,20,144)
440 CALL HCHAR(15,21,145)
450 CALL HCHAR(15,22,146)
460 CALL HCHAR(15,23,147)
470 CALL HCHAR(16,20,146)
```

Tuning Fork

```
480 CALL HCHAR(16,21,147)
490 FOR DELAY=1 TO 2500
500 NEXT DELAY
510 CALL CLEAR
520 FOR C=1 TO 16
530 CALL COLOR(C,2,8)
540 NEXT C
550 PRINT "ENTER NUMBER OF STRING  
TO HEAR CORRECT SOUND OF  
PROPERLY TUNED STRING!"
560 PRINT
570 PRINT "SOUND WILL REPEAT, ALLOWING  
YOU TO ADJUST YOUR GUITAR'S  
TUNING."
580 PRINT
590 PRINT "PRESS 0 TO END THE PROG  
RAM."
600 PRINT
610 PRINT "1)E/FIRST STRING"
620 PRINT
630 PRINT "2)B/SECOND STRING"
640 PRINT
650 PRINT "3)G/THIRD STRING"
660 PRINT
670 PRINT "4)D/FOURTH STRING"
680 PRINT
690 PRINT "5)A/FIFTH STRING"
700 PRINT
710 PRINT "6)E/SIXTH STRING"
720 PRINT
730 INPUT "ENTER STRING NUMBER.":Y
740 IF Y=0 THEN 1660
750 ON Y GOTO 760,870,980,1090,1200,1310
760 CALL CLEAR
770 GOSUB 1420
780 CALL COLOR(1,16,8)
790 FOR I=1 TO 20
800 CALL SOUND(1000,1319,3)
810 FOR DELAY=1 TO 500
820 NEXT DELAY
830 NEXT I
840 CALL CLEAR
850 CALL COLOR(1,2,8)
860 GOTO 520
870 CALL CLEAR
880 GOSUB 1420
890 CALL COLOR(2,16,8)
900 FOR I=1 TO 20
910 CALL SOUND(1000,988,3)
920 FOR DELAY=1 TO 500
930 NEXT DELAY
940 NEXT I
950 CALL CLEAR
960 CALL COLOR(2,2,8)
970 GOTO 520
980 CALL CLEAR
990 GOSUB 1420
1000 CALL COLOR(13,16,8)
1010 FOR I=1 TO 20
1020 CALL SOUND(1000,784,3)
1030 FOR DELAY=1 TO 500
1040 NEXT DELAY
1050 NEXT I
1060 CALL CLEAR
1070 CALL COLOR(13,2,8)
1080 GOTO 520
1090 CALL CLEAR
1100 GOSUB 1420
1110 CALL COLOR(4,16,8)
1120 FOR I=1 TO 20
1130 CALL SOUND(1000,587,3)
1140 FOR DELAY=1 TO 500
1150 NEXT DELAY
1160 NEXT I
1170 CALL CLEAR
1180 CALL COLOR(4,2,8)
1190 GOTO 520
1200 CALL CLEAR
1210 GOSUB 1420
1220 CALL COLOR(5,16,8)
1230 FOR I=1 TO 20
1240 CALL SOUND(1000,440,3)
1250 FOR DELAY=1 TO 500
1260 NEXT DELAY
1270 NEXT I
1280 CALL CLEAR
1290 CALL COLOR(5,2,8)
1300 GOTO 520
1310 CALL CLEAR
```

Continued on p. 52

Tuning Fork

```

1320 GOSUB 1420
1330 CALL COLOR(14,16,8)
1340 FOR I=1 TO 20
1350 CALL SOUND(1000,330,3)
1360 FOR DELAY=1 TO 500
1370 NEXT DELAY
1380 NEXT I
1390 CALL CLEAR
1400 CALL COLOR(14,2,8)
1410 GOTO 520
1420 CALL HCHAR(3,13,91,11)
1430 CALL HCHAR(6,13,92,11)
1440 CALL HCHAR(9,13,92,11)
1450 CALL HCHAR(12,13,92,11)
1460 CALL HCHAR(15,13,92,11)
1470 CALL HCHAR(18,13,92,11)
1480 CALL HCHAR(21,13,92,11)
1490 FOR C=1 TO 16
1500 CALL COLOR(C,2,8)
1510 NEXT C
1520 CALL COLOR(8,5,8)
1530 CALL VCHAR(4,23,33,20)
1540 CALL VCHAR(4,21,40,20)
1550 CALL VCHAR(4,19,128,20)
1560 CALL VCHAR(4,17,56,20)
1570 CALL VCHAR(4,15,64,20)
1580 CALL VCHAR(4,13,136,20)
1590 CALL HCHAR(1,16,144)
1600 CALL HCHAR(1,17,145)
1610 CALL HCHAR(1,18,148)
1620 CALL HCHAR(1,19,149)
1630 CALL HCHAR(2,16,146)
1640 CALL HCHAR(2,17,147)
1650 RETURN
1660 END

```



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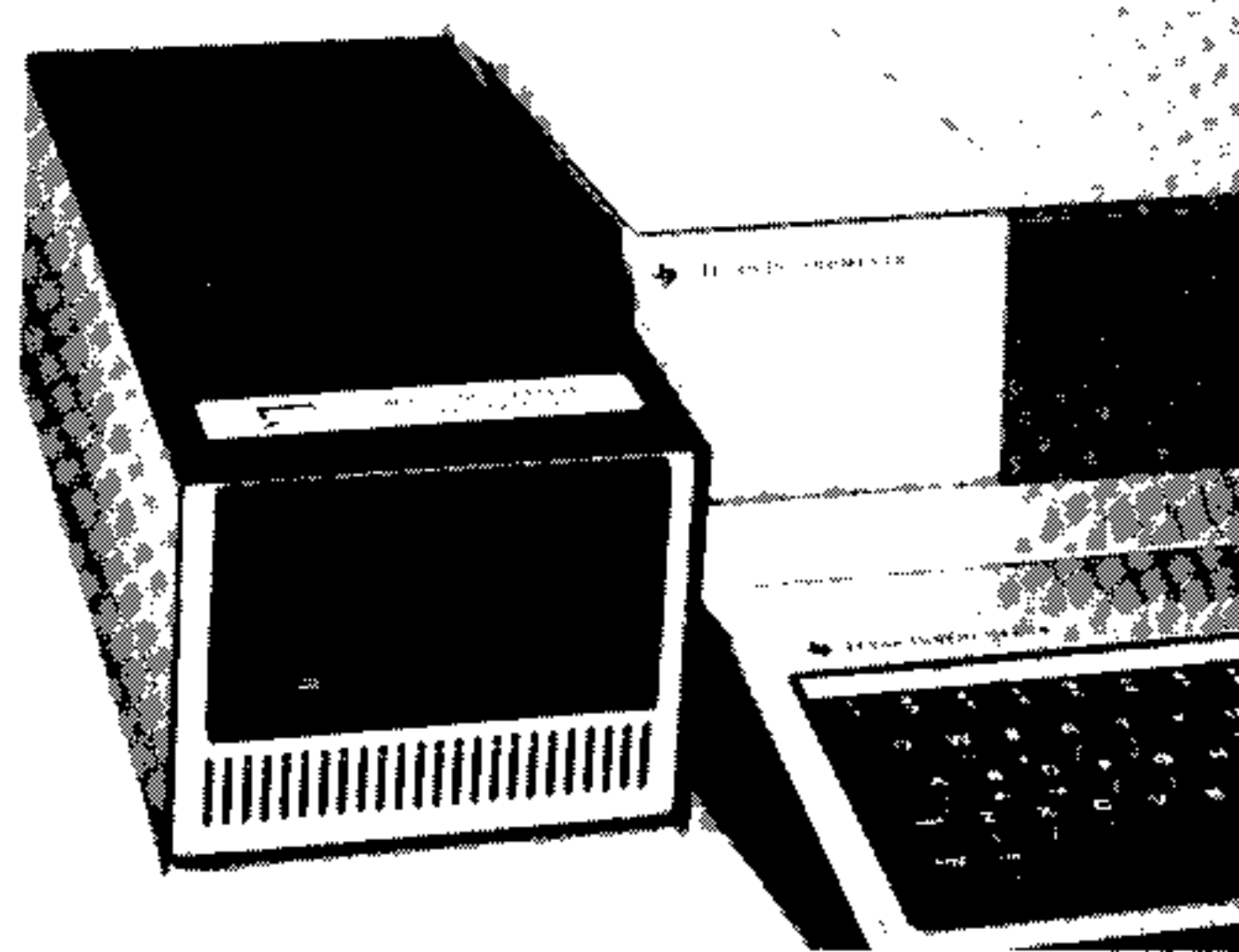
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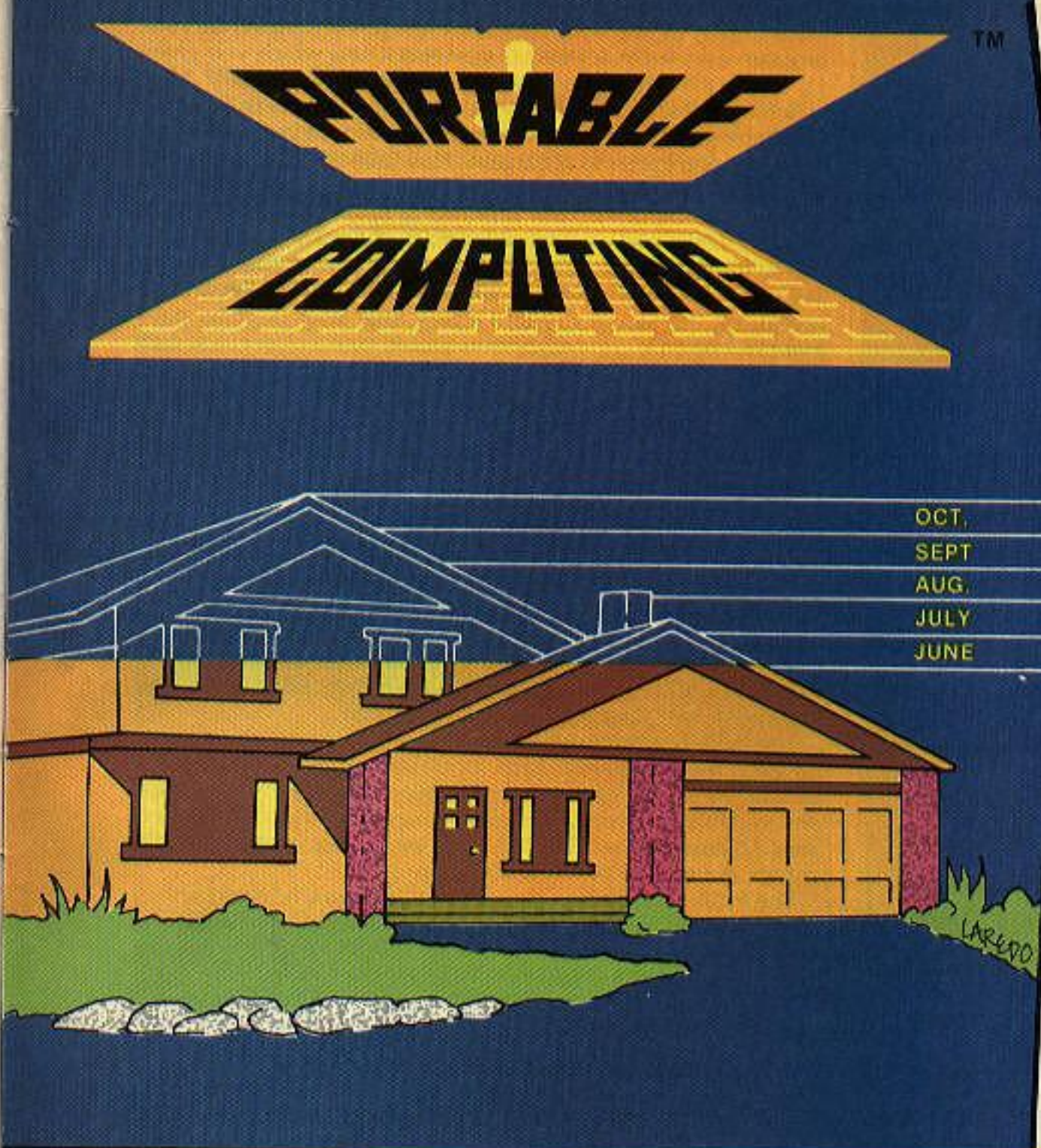
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COMPACT COMPUTER 40

AMORTIZATION SCHEDULE

Touring Compact Computer Country Part III

LOOKIN' for a HOME

By David G. Brader

In the last few articles on portable computing, we have told you about many of the features of the El Compact Computer 40. We have taken you on a tour of the keyboard and explored a few of Enhanced BASIC's elements. Now it's time to put our knowledge to work. Just what good is this cute little machine? It doesn't have a full screen display, so video gaming is probably out of the question. It doesn't have a sound generator (other than a simple beep sound), which means music with three part harmony is not possible. It seems likely, therefore, that this machine was designed for the less frivolous, more practical applications.

Here is just such a task—one that is simple but very useful: a program to calculate the amortization schedule for a loan. This Enhanced BASIC program can be used to determine the periodic monthly payment of a loan, the final payment on that loan (which often is not the same as the periodic payment), and the statistics for any specific or all payments. In each case, the statistics include the amounts applied to the principal and interest and the balance due on the principal.

Curbside Manor

It looks like the economy is picking up a bit, and mortgage interest rates have come down in recent months. More and more folks are driving around looking at houses. As they look, each family is trying to determine what they can afford in the way of monthly payments.

If you are in this position and own a Compact Computer model ICC-40, you may save some time (and heartache) with this program. Before you fall in love with that house on the corner of Elm Street, use the CC-40 to see if the fixed rate mortgage is within your range.

By entering the mortgage amount—say \$125,000 (what a dreamer, right?)—the number of payments (360 over 30 years), and finally, the interest rate (12%), we can immediately see that the periodic monthly payment will be \$1285.76! Well, maybe we should look on the other side of town.

Wait a minute—not so fast. How much of that payment is interest that will reduce your income tax liability? Will the amount of money you save on taxes make up a sufficient portion of the mortgage payment to put it in your range? Glancing at the CC-40, you see it still has the periodic pay-

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ment displayed, so you press the [ENTER] key, and the final payment display at \$1287.82 appears. Press [ENTER] again and the program asks SHOW SCHEDULE FROM PERIOD? (to which you enter 1), and TO PERIOD? (you enter 12 to see the first year). After watching the schedule roll by, you realize that almost \$15,000 would be spent on interest that first year. What a great write-off!

Maybe you can find a bargain. How about heading over to the other side of town? Perhaps here you find an older home that needs a bit of TLC but is priced at only \$52,000. And the FHA mortgage can be assumed at 9.5%. Quickly, you grab the CC-40 from the back seat. Turning on the power (blessing the TI Constant Memory feature), you enter RUN. A few keystrokes reveal, via the Liquid Crystal Display, that your periodic payment will be \$437.24. Maybe you should take a closer look and see if you can fall in love with this one.

28 BASIC Lines

Although quite short, this Amortization Schedule program demonstrates many of the powerful features that are so useful in TI Enhanced BASIC. In the very first line we find something worth mentioning—the PAUSE statement. You will find that you frequently use this feature when displaying anything on the one line LCD. PAUSE may be used in two modes: first, to specify a (timed) delay between statements, and second, to delay a statement indefinitely until the operator presses the [ENTER] key. Notice that the first line (and several others in the program) is made up of several statements. In Enhanced BASIC, the statements are separated by a single colon.

The INPUT statement can output a separate prompt message for each input required. Each input prompt is separated from its variable list by a semicolon. Similarly, every input prompt and variable list is separated from the others by commas (see lines 110 and 200) so that individual input prompts and variable entries are started on a clear display.

The PRINT statements, as used in this program, could just as well have been DISPLAY statements. The choice was arbitrary. The DISPLAY statement in Enhanced BASIC is as powerful as the one in Extended BASIC on the Home Computer.

As with Extended BASIC, PRINT is used primarily for external output to devices such as the 4-color printer and other Hexbus peripherals. DISPLAY sends output exclusively to the built-in LCD.

The USING clause is illustrated in this program in conjunction with both the IMAGE statement and the quoted strings that are part of the PRINT statement. Line 280 demonstrates the former and line 180 is an example of the latter.

The IF construct in line 220 shows the power available for programming logical sequences. Not only does it feature an ELSE clause, but it allows multiple conditional statements to be included after the THEN and/or ELSE. As a result, the program-

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mer spends less time and effort debugging the program and more time putting it to use.

The Water's Fine

The best way to learn about your new CC-40 and how to program it is to jump in and start using it. By the simple act of keying in the *Amortization Schedule* program included here, you will probably begin discovering and learning. You will start to wonder why something was done a certain way and think of other things you would like the program to do. Before long, you will find yourself trying simple modifications to the program. And that is when the real fun starts.

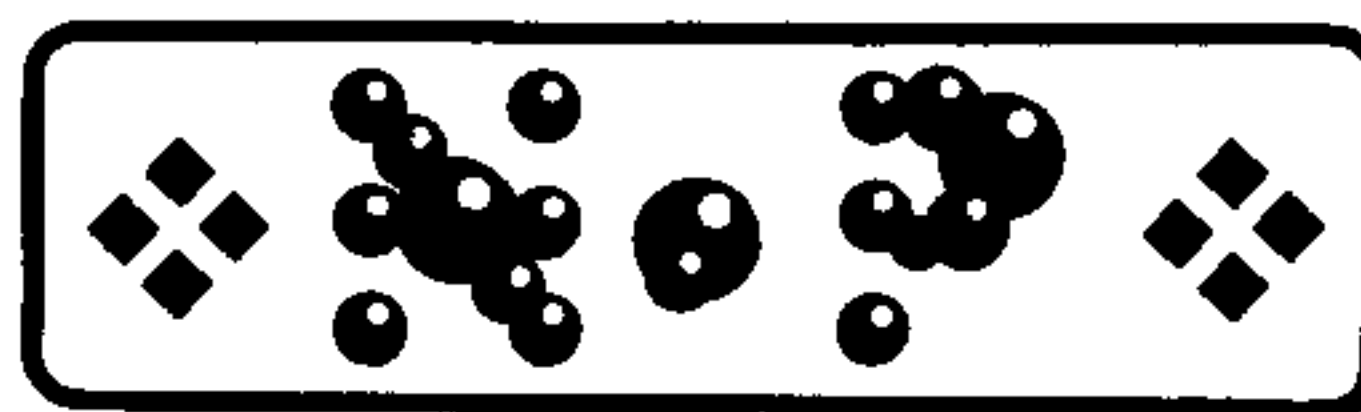
Amortization Schedule Explanation of the Program

Line Nos.	
100	Program title display.
110-120	Input the loan parameters.
130-170	Perform calculations for total loan value, periodic and last payments.
180-190	Display periodic and last payments.
200	Input the first and last periods for which a schedule will be calculated.
210	Current loan value L is calculated prior to loop.
220	If the last period for this schedule is the last payment of the contract, set FLG=1 for special handling of the last schedule entry.
230-310	The loop to output all but possibly the very last schedule entry.
240	Calculates the current balance.
250	Displays the schedule period number.
260	Current interest and principal are calculated, and the balance is saved for the next round as the variable L.
270	IMAGE statement for use in lines 180 and 350.
280	Output the interest and principal to the display.
290	IMAGE statement for use in line 300 and line 360.
300	Output the current loan balance to the display.
310	End of loop.
320	If FLG=0, end the program.
330-370	Output the special case information for the final payment.

```

100 DISPLAY BEEP,"AMORTIZATION SCHEDULE":PAUSE 1
110 INPUT "LOAN AMOUNT? ";LOAN,"NO. OF MONTHLY
    PAYMENTS? ";N
120 INPUT "ANNUAL INTEREST RATE %?";IN
130 IN=IN/100
140 PMT=LOAN*(IN/(1-(1+IN)^(-N)))
150 TOT=INT(PMT*N*100)/100
160 PAY=INT(PMT*100)/100
170 LASTP=TOT-PAY*(N-1)
180 PRINT USING "PERIODIC PAYMENT- $####.##";PAY:
    PAUSE
190 PRINT USING "FINAL PAYMENT = $####.##";LASTP:PAUSE
200 INPUT "SHOW SCHEDULE FROM PERIOD? ";STRT,"TO
    PERIOD? ";STP
210 K=(1+IN)^(-(STRT-1)):L=1/K*(PMT*(K-1)/IN+LOAN)
220 IF STP=N THEN FLG=1:STP=N-1 ELSE FLG=0
230 FOR Z=STRT TO STP
240 K=(1+IN)^(-Z):BAL=1/K*(PMT*(K-1)/IN+LOAN)
250 DISPLAY BEEP,"PERIOD ";Z:PAUSE 1
260 I=BAL-L+PAY:L=BAL:PR=PAY-I
270 IMAGE INT=$####.## PRIN=$####.##
280 PRINT USING 270,I,PR:PAUSE
290 IMAGE BALANCE=$#####.##
300 PRINT USING 290,BAL:PAUSE
310 NEXT Z
320 IF FLG=0 THEN END
330 DISPLAY BEEP,"PERIOD ";N:PAUSE 1
340 I=LASTP-BAL:PR=BAL:PR=0
350 PRINT USING 270,I,PR:PAUSE
360 PRINT USING 290,BAL:PAUSE
370 END

```

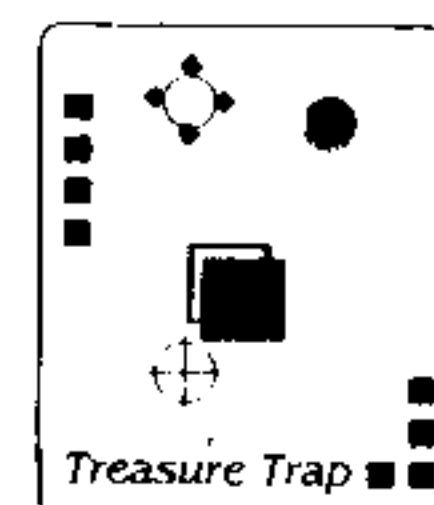


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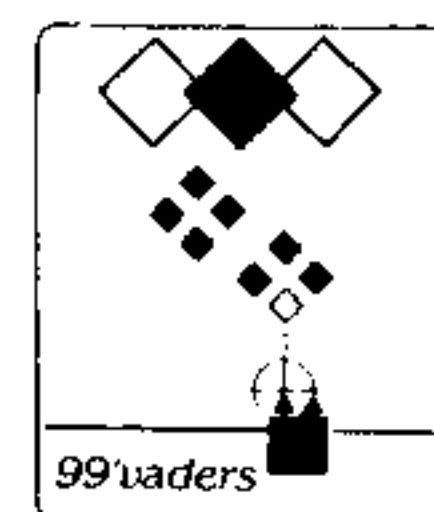
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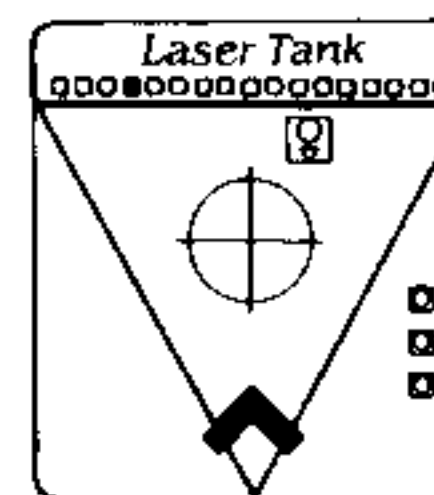
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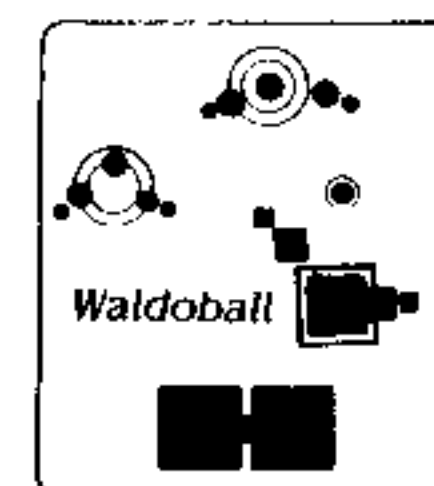
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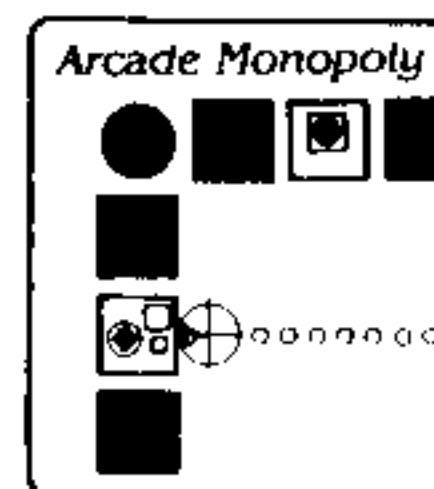
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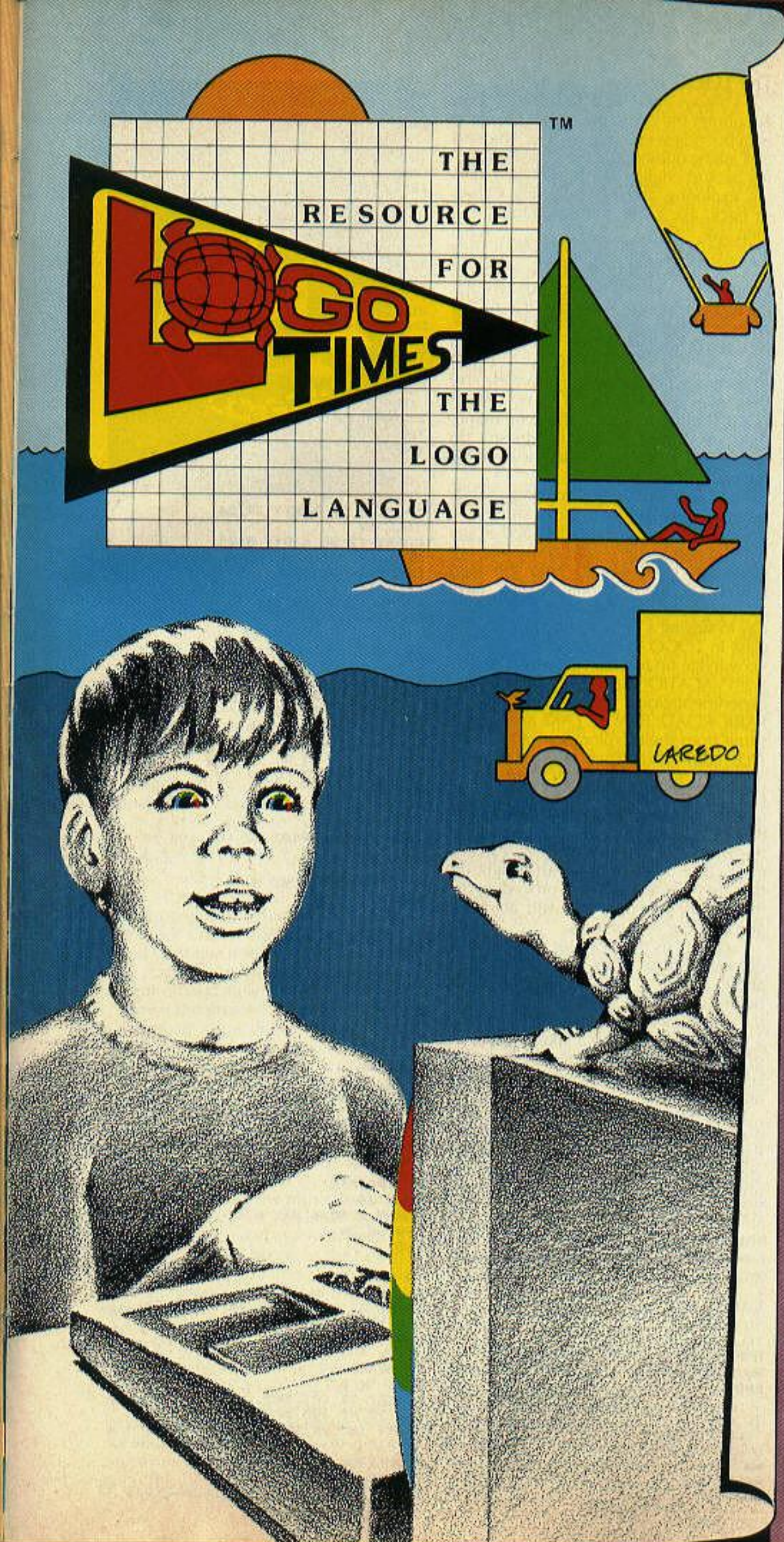
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. . . From The People Who Know The Home Computer Best



Our Pal, LOGO TURTLE

By Reva Hunter

3948 Uranus Ave.
Lompoc, CA 93436

It's Monday morning and my third grade students are beginning to assemble in our self-contained classroom. Happy chatter fills the room as boys and girls hang up coats, unpack backpacks and begin hurried games of Battleship or checkers before the morning bell signals the start of another school day. The room looks like many classrooms throughout America—tables arranged in squares and rectangles, a listening post, a science and math center, a reading center, and a spelling center. Books and educational games are stacked on low shelves within easy reach of the students.

Suddenly, an excited boy tugs at my arm and says, "There's a message today!" His delight is obvious as he points to the stand at the front of the room. On the stand is a letter from our old friend, LOGO Turtle. LOGO Turtle has been writing to us since the end of September. Once a week (usually Monday morning), he greets the boys and girls with a cheerful, "Hi Pals," and an invitation to try something new on our TI computer. The students look forward to both his messages and their turns at the computer.

Center of Attention

The computer is another "center" in our room. Every student gets a turn at the computer in the weekly rotation of centers. The students await their 20-30 minute turns with happy anticipation. Never do they ask to be "delayed" or "deleted" from their turns. In fact, eager students often ask if there will be enough time before lunch for them to get in an extra turn.

LOGO Turtle's message each week encourages the students to try something new on the computer. From his first message, he has asked the students to try new commands and procedures. They have learned that LOGO shares many of the words of their world, and that he will patiently learn words that they want to teach him. Telling their turtle friend to go forward, right, left, and back has pulled many students into a math lesson without their being aware of it. It is not uncommon to hear students stating the number of degrees in a circle, or asking whether 90 degrees will send the turtle to the west or to the east. How many sides does a square have? How many 90 degree turns? Can I make a circle by small steps forward and small turns to the left or right?



Introduction

LOGO Times is an information resource for anyone interested in participating in the creation of their own personal language—one that will easily allow them to communicate with a computer in a totally new audiovisual realm of applied imagination, exploration, and self-discovery. The articles on these pages concern the use of the new TI LOGO language, but readers do not need any additional software or equipment (or even a computer) to understand and learn from the material presented here.

If readers want to actually experience a TI LOGO environment, they will need either a TI-99/4 or TI-99/4A computer, the Expansion Memory peripheral, and TI LOGO Command Cartridge. A disk drive, although convenient to have, is not required; a user's work may alternately be saved on cassette tape, printed out on the TI Thermal Printer, or hand copied into a notebook (for later re-keyboarding).

In each issue, one or more of the articles may reference or build upon the topics discussed in a previous article. It is therefore recommended that for maximum benefit and understanding, new readers obtain the appropriate back issues of 99'er Home Computer Magazine containing LOGO Times articles.

NOTICE

LOGO Times is actively soliciting articles. Manuscripts should be typed double-spaced, and accompanied by a cassette tape or disk if containing any lengthy procedures or graphics.

Send all materials to:

LOGO Times Editorial Dept.
99'er Home Computer Magazine
1500 Valley River Dr., Suite 250
Eugene, OR 97401

All mail directed to the Letters to the Editor column (Letters and LOGO) will be published in accordance with the conditions set forth on 99'er Home Computer Magazine's Masthead page.

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The LOGO Motive

It's always interesting to watch students encounter the computer. Some charge in with boundless enthusiasm, touching keys and asking questions at the same time, going back to change words just typed, talking, exploring, and then reflecting. Others sit back, ask a shy question, timidly try, then ask, "Can I... Will he... What if...?" It is with these students that LOGO Turtle is at his best. He waits patiently. There are no bells or buzzers urging quick responses. He waits. If a student types in a message that he can't execute, he doesn't hesitate or stop. He says, "Tell me more," or "Tell me how to..." The students are delighted. They have ideas of their own that they want to try. When LOGO Turtle does what they command, they are thrilled. When he doesn't do what they thought he would, they rethink, replan, and try again.

Computer work need not be a solitary activity. We have two older students—Kevin Lake, a fourth grader, and Roger Byler, a fifth grader—who come into our classroom each day to help the third graders at the computer. They have devoted an hour or two after school each day to staying a step or two ahead of our class in LOGO expertise. They pass this knowledge on to their students. The program VACATION arose out of their LOGO experimentation. The procedures for PARK, ROAD, BEACH, LAKE and GRASS came from their exploration of the TELL TILE command. They used the sprite mode to create BALLOON, CAR, TRAF-FIC, TREE, and BOAT. Their desire to make an animated picture led to the development of SAIL and JOG, as well as the movement of the balloon, car and truck. Both boys smiled with delight the day they perfected their procedure for making their people jog with animated arm and leg movements.

Each day as the boys set to work new questions arose. Can we do this? How about adding...? Can we make...? Before long, a complete vacation scene had developed from what had started as a picture of a boat on a lake. They were still streamlining and perfecting their procedures when the following listing was made.

It has been a pleasure to watch as they use LOGO to think in what Seymour Papert* calls "mind-sized bites." And as you might guess, the third graders are now using some of these procedures in their explorations of LOGO.

*Papert, Seymour. *Mindstorms: Children, Computers, and Powerful Ideas*. New York, Basic Books, Inc., 1982.

VACATION

TO VANISH
TELL :ALL
HOME
SH 0 SC 0 SS 0
END

TO JOG
TELL [15 16]
CARRY 15
WAIT 10
CARRY 25
WAIT 10

CARRY 26
WAIT 10
JOG
END

TO PEOPLE
CALL [15 16] "BATHERS
TELL :BATHERS
CARRY 15
SH 0 SC 1
TELL 15 SXY 50 (- 15)
TELL 16 SXY 36 (- 14)
TELL 15
SH 270 SS 5
TELL 16 SH 270 SS 3
JOG
END

TO GRASS
MAKE "M 0
REPEAT 32 [PT 121 :M 20 PT 121
:M 21 PT 121 :M 22 PT 121 :M
23 MAKE "M :M + 1]
TELL TILE 121 SC [2 3]
END

TO BOAT
TELL 9
CARRY 9 SC 6 SXY 24 24
TELL 12
CARRY 12 SC 6 SXY 8 24
TELL 10
CARRY 10 SC 15 SXY 8 40
TELL 11
CARRY 11 SC 10 SXY 24 40
END

TO TREE
CALL [1 2] "TOP
CALL [3 4] "TRUNKS
TELL :TOP CARRY :BALL
SC 2 SXY - 35 16
TELL 1 SH 270 FD 40
TELL :TRUNKS CARRY :ROCKET
SC 8 SXY - 35 0
TELL 3 SH 270 FD 40
END

TO LAKE
MAKE "J 0 REPEAT 32 [PT 100 :J
10 PT 100 :J 9 MAKE "J :J + 1
J
TELL TILE 100 SC 5
END

TO BALLOON
TELL 17
CARRY 17
SC 13
SXY 10 60
SH 90
SS 2
END

TO ROAD
MAKE "L 0
REPEAT 32 [PT 113 :L 16 PT 113
:L 17 PT 113 :L 18 PT 113 :L
19 MAKE "L :L + 1]
TELL TILE 113 SC [1 15]
END

TO TRAFFIC
TELL 24
CARRY 2 SC 6 SXY 0 (- 40) SH
90 SS 20
END

TO CAR
TELL 23
CARRY 23 SXY 0 (- 46) SH 270
SC 13 SS 26
END

TO BEACH
MAKE "K 0
REPEAT 32 [PT 105 :K 11 PT 105
:K 12 PT 105 :K 13 PT 105 :K
14 PT 105 :K 15 MAKE "K :K + 1
J
TELL TILE 105 SC [14 14]
END

Continued on p. 61



Dear Sir,

At the March meeting of the Texas Computer Education Association, TI allowed me to play with a prototype of their LOGO II Command Cartridge for a couple of hours. The first batch of GROMs for the new Command Cartridges has reportedly just been shipped off to be assembled, so the cartridges should be available from retailers by early summer (no kidding about this date). Unlike some computer manufacturers, TI continues to make most of their new software compatible with older equipment and software. Therefore, to upgrade a LOGO system to LOGO II, all you need is the new Command Cartridge. (This lists at \$129.95 but is available at a discount through many 99'er advertisers.) Of course the old LOGO Command Cartridge is still very good software, and you do not have to upgrade your system immediately.

I think the greatest feature of LOGO II is its music capabilities. TI's new Command Cartridge makes serious use of Jeanne Bamberger's theory that music is a good vehicle for cognitive development/problem solving. LOGO II allows users to create melodies in any combination of three voices. Music is added to a music-buffer with commands specifying the voice (SETVOICE 0, 1, 2 or 3; SETVOICE 0 clears out the music buffer) and the volume (e.g., SETVOLUME 1). To append notes to the end of the buffer (so that whatever is added becomes the next part of the melody), you use the command MUSIC, followed by a list of the notes (a range of about three octaves is available) and a list of the notes' durations.

LOGO II is consistent in its use of the SET command convention for the music commands SETVOLUME, SETVOICE, and SETTEMPO xx (which allows for different speeds of playing). Unfortunately, this does not allow consistent short forms since SV already means SETVELOCITY. Nor can PN stand for the command PLAYNOTE; PN is already the short form for PRINTNAMES.

Ordinarily, music played in LOGO II has continuous sound from the start of one note to the start of the next (unless a REST is specified) such as you would hear when music is played *legato*; the LEGATO command can be overridden with STACCATO. No music is played in LOGO II (even if there are instructions in the music buffer) unless the command PLAYMUSIC (or PM) is typed; then the whole buffer is played. If the command PLAYNOTE is typed, just one note in the buffer is played (the buffer keeps track of played and unplayed notes). LOGO II is much more than just a fancy *Music Maker* Command Cartridge. It allows you to write music with programs, to write music with recursive programs, to store music with your programs on disk or tape, and to combine music with SPRITE and Turtle programs. And you can use the Bamberger Tune Blocks games to learn music and to see the syntax of music.

The expansion of available memory from 8 to 16K is another important feature of LOGO II. Although some of this expansion was accomplished through code compaction, most of the memory savings was achieved by "overlaying" LOGO software into RAM so that less RAM is used. Ordinarily when overlays are used, there is a significant degradation in computer response time since pieces of code must be shunted back from GROM as they are needed and then overlaid. In my all too brief time with the new Command Cartridge, I could not detect any change in response time. If this is so, then the TI programmers have managed to overlay parts of LOGO that are never used (or rarely used) together. The near doubling of available memory decreases the likelihood that you will ever again have your computer "lock up" in LOGO because you are "out of space." To make the memory go even further, TI has restored (from very early prototypes) the forced garbage collection command (.GC allows you to direct LOGO to clean up memory stacks and thus get much more mileage out of the memory). They have also enriched ERASE so that you can now erase not just programs, but names as well. A new operation called .NODES tells you how much memory is left.

Programs can now be printed on RS232-compatible printers through a new option added to SAVE. It appears as if there either is or soon will be an additional storage device or a way of recalling information from a RS232-compatible device (perhaps another TI LOGO system) since there is an undocumented OTHER Option as well. It will certainly be a relief to get hard copy from printers other than the thermal printer; its only redeeming feature was its low cost.

The manual that comes with the new Command Cartridge is quite a bit longer than the TI LOGO manual. The author, Dan Watt, is one of the early converts to LOGO from the old MIT LOGO lab, and his expertise is evident. Since he was allowed more pages for his manual, he was able to include some of the more ad-

Continued on p. 72

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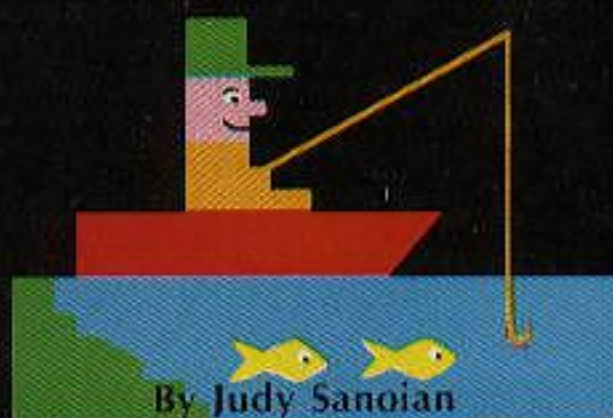
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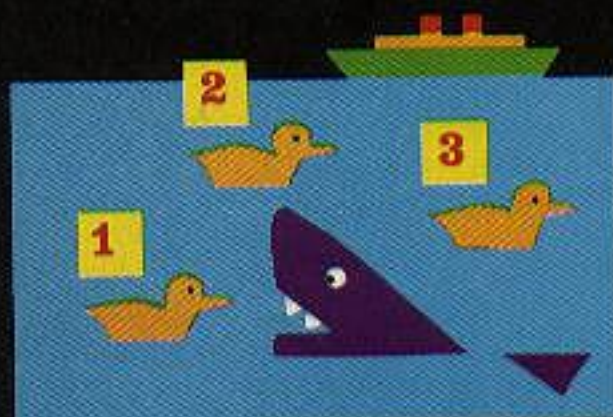
A REVIEW OF UPPER ROOM SOFTWARE FOR SPECIAL LEARNERS



	Poor	Fair	Good	Excellent
Engrossment				
Educational Content				
Ease of Use				
System Utilization				

Good teachers seem to have an innate set of criteria they apply when selecting educational materials, be they books, filmstrips, games, or other items. They ask themselves: Will this hold my students' interest? What information does this impart or what skill will it develop? Is it simple enough for them to use and understand? Is it worth the price?

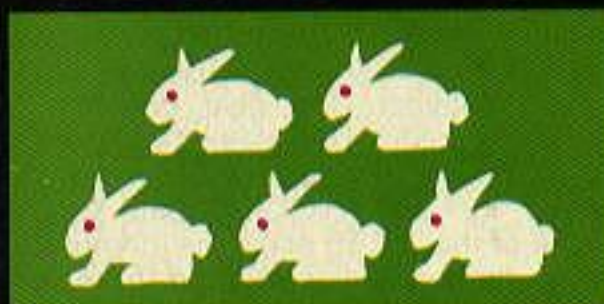
When it comes to evaluating educational software, the criteria are no different. We all know of computer games that hold students transfixed for hours while they learn such valuable "skills" as space alien extermination or toad eradication. On the other side of the coin are the educational drills that have children fidgeting in their



chairs after five minutes. Finding materials that can both teach and hold the student's attention is essential. Well-designed software should also take maximum advantage of the computer's capabilities. After all, what is the point in spending hundreds of dollars on hardware when the program has students performing drills that could be done just as effectively with pencil and paper?

These criteria—and a few others—also apply when considering software for handicapped learners. The Upper Room Microcomputer Consultants have developed a package of educational software for handicapped students. Keeping the needs of non-readers in mind, these programs make extensive use of color graphics, animation, and synthetic speech. The eight programs cover a wide range of skills and subjects. *Keyboard Fun* is designed to help students identify and select the correct keys on the keyboard. *Early Counting Fun* offers drills in counting from 1 to 9. *Shark Counting* provides more extensive counting practice. *The Talking Typewriter* lets children identify letters, form words and construct sentences. *Fish and Count* integrates a counting activity within a game. *Addition* and *Subtraction* both offer drill

$$2 + 3 = 5$$



and practice in simple arithmetic problems. Finally, *Basic Arithmetic* provides problem-solving activities in addition, subtraction, multiplication, and division.

A manual for running the programs is included with each of the packages. The program designers mention an important point in their introduction: "The computer should never become a replacement for sensitive one-on-one human contact." Bearing this—and the special needs of handicapped learners—in mind, let's see how Upper Room's packages measure up.

Will It Hold Their Attention?

First of all, we should never assume a student will be captivated by an uninteresting, repetitive drill simply because she is a slow learner. In other words, the attention span does not lengthen proportionately with the level of handicap. Upper Room takes this into account. While some of the exercises are, necessarily, very simple, Upper Room usually adds an incentive—a fun part—to engage the student's interest. They also present exercises on several levels when skills (such as learning to count) require

constant drilling. For example, *Early Counting Fun* requires the child to count the number of ducks, dogs or rabbits on each screen. If the answer is correct, the ducks flap their wings, the dogs sit down, and the white rabbits turn black. Once this straightforward drill is mastered, there is a more challenging game, *Shark Counting*, to further exercise counting skills.

With all the exercises, an incorrect response will—if you have the Speech Synthesizer—result in a variety of UH-OHS and TRY AGAINs. Keeping sensitive egos in mind, the program never tells a student he is wrong. There is, however, a problem with some of the games' responses: If a program is run without the Speech Synthesizer, there is virtually no response. In *Keyboard Trainer*, for example, the student must identify the flashing typewriter key by pressing the correct key on the keyboard. Without the optional Speech Synthesizer, a correct answer receives no reinforcement—no GOOD JOB!, victory music, or graphic display. The exercise merely goes on to the next letter. It is probably not necessary to go into the importance of positive reinforcement. We all need a pat on the back, and children usually like a loud, colorful one.

Continued on p. 74



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LOGO Turtle . . . from p. 58

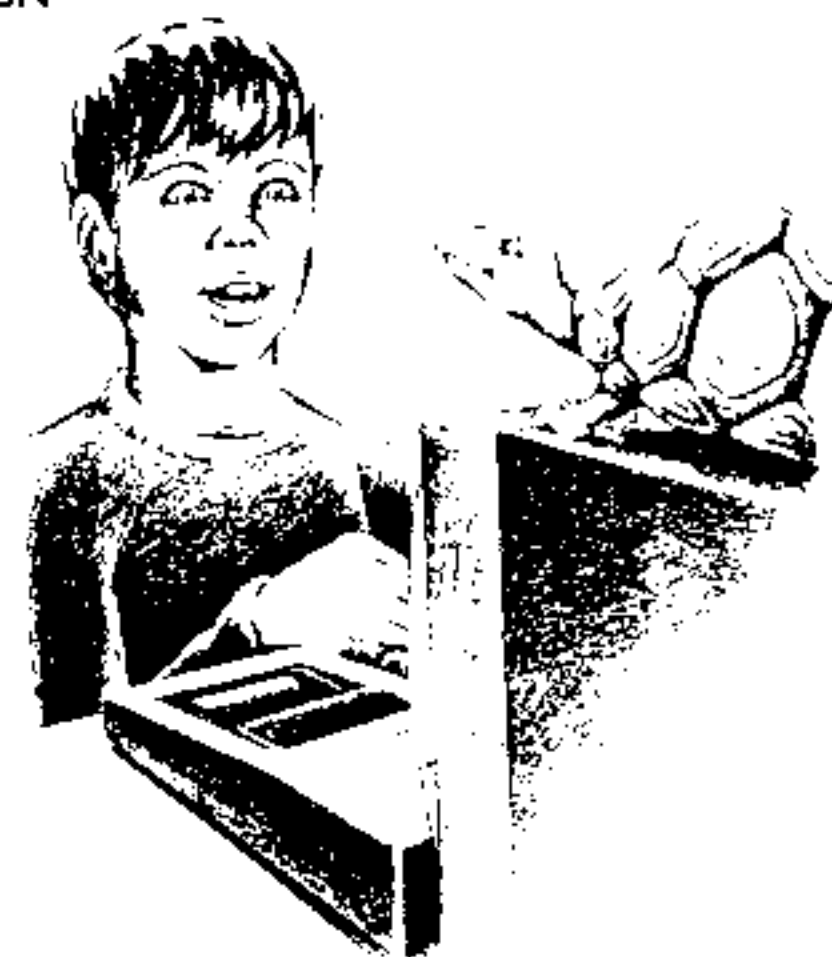
TO SAIL
CALL [9 10 11 12] "BT
TELL :BT SH 90 WAIT 50 SS 15
END

TO PARK
MAKE "L 0
REPEAT 32 [PT 113 :L 16 PT 113
:L 17 PT 113 :L 18 PT 113 :L
19 MAKE "L :L + 1]
TELL TILE 113 SC [1 15]
END

TO SKY
TELL 5
CARRY :BALL SC 10 SKY 100 85
END

TO VACATION
BALLOON
ROAD
TRAFFIC
CAR
BEACH
LAKE
TREE
SKY
BOAT
SAIL
GRASS
PEOPLE
END

99'er



DEBUGS ON DISPLAY



99'er Program Bug

We have uncovered a mild-mannered Debug in Super Language: Programming Sprites in Mini Memory (April, 1983). In Part 13 of the listing (p. 61) the AORG > 7FF8 should read > 7FE8 and DATA > 7FF8 should also read > 7FE8. To those who had trouble keying in Giant & Dwarfs (April, 1983, p. 24)—a word of advice—check all 8's

and B's to be sure you have typed in the right character. The program does run fine.

A line was left out of The School Secretary's Secretary in the May issue on p. 39 top of the second column. That sentence should begin: "The application will display THAT CODE HAS BEEN USED if you . . ."

In this same May's issue, on p. 60 in the Explanation of the Program for Findex, please subtract 70 from all line numbers beginning at line 280. The last line will then be 3420.

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Joy Talk is Cheap

A Low-Cost RS232 Interface Through the TI-99/4A Joystick Port

By Paul Urbanus

6302 Elgin #278
Lubbock, TX 79413

Caveat Joytalker

This article is not for the beginner. If you have electronic construction experience (and some skill in soldering) you can successfully complete the Joytalk system. The hardware required approximately 8 hours to fabricate (including time to gather the parts) in the 99'er lab. The cost for all the parts was under \$40. Remember, a mistake in hardware construction is more costly than in software construction—it cannot be corrected with just a few keystrokes!

In the process of computer programming, there eventually comes a time to communicate your results to the outside world. For personal computers, the RS232 serial interface has become the standard link allowing you to communicate to a printer, a plotter, or other peripheral. This first article will describe the hardware required to implement the RS232 output function through the joystick port of the TI-99/4A. (Software will be covered next month.) In this way, users who don't have a peripheral expansion system can output to a printer or other serial device using only a Mini Memory cartridge and some low-cost hardware. The software/hardware combination allows the setting of baud rate (110–19.2K), stop bits, parity, and auto carriage return/line feed. The worst baud rate error occurs at 19.2K baud, and is less than 0.2%. A provision is also included to add baud rates which are not preprogrammed.

To better understand the hardware and software design tasks, a definition of "RS232" is needed. RS232 is a serial communications standard which defines both electrical specifications and a data transfer protocol. Its electrical characteristics include such things as voltage and loading levels. The relationship between these logic and voltage levels is of interest to us. Notice that the electrical levels are inverted from the logic levels (logic 0 = +V and logic 1 = -V) for RS232.

A transfer protocol is needed for proper flow of data. For the RS232, this protocol specifies the serial data format, as well as the method of *handshaking*. The handshaking in this

case involves checking the DATA TERMINAL READY signal to ensure that the remote device (i.e., the printer) is ready to accept data. The serial data format is shown in Figure 1. Notice that there are four distinct pieces which are put together to form the actual data which is transmitted. In this case, an ASCII "A" which occupies seven bits is being transmitted. There are also 3 control bits, which are required both to mark the beginning (START BIT) and end (STOP BIT) of a character, and to perform limited error checking (PARITY BIT). Thus 10 bits are actually transmitted (7 character bits + 3 control bits). For every character transferred, 3 extra bits have been added to "control" the transfer. These control bits are completely transparent to an RS232 user, who merely sends the 7-bit character code to an output subroutine, at which point the control bits are added. Conversely, the receiving device strips off the 3 control bits and uses only the 7-bit character. In the time between transmission of characters, the output logic level is set to 1 (negative RS232 level).

The Hardware

Before the hardware design is started, the I/O structure of the joystick port must be determined. In the 99/4A, the keyboard and joysticks are mapped into an 8 by 8 matrix. The matrix column select lines are *active low*, and are driven by an 8-output *open-collector decoder*. This decoder is controlled by three lines from the system I/O chip (TMS9901). Six of the column selects scan the keyboard. The remaining two are buffered and brought out to the joystick port to select player 1 or player 2 input (or neither). There are five input lines from the joystick input (UP, DOWN, LEFT, RIGHT, and FIRE), but only one joystick select line may be active at a time. Two pins on the joystick port have no internal connection. The absence of power or ground on the joystick port poses a problem. To get around this, ground and +12V must be *stolen* from the video output connector where they are provided to power the RF modulator.

Given the joystick port structure and available power, im-

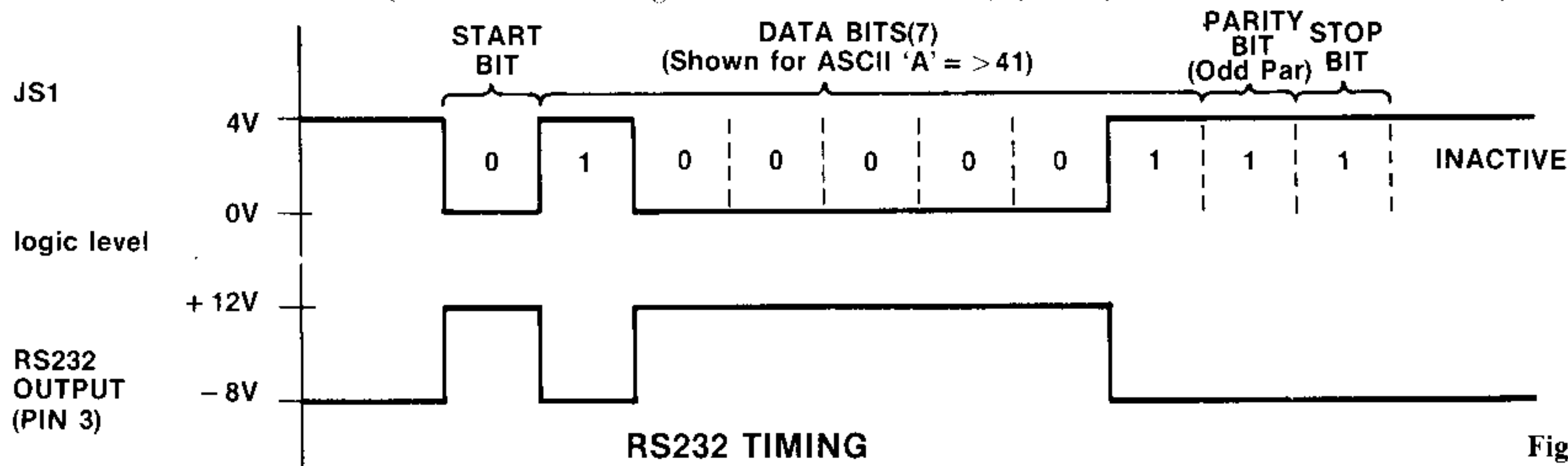
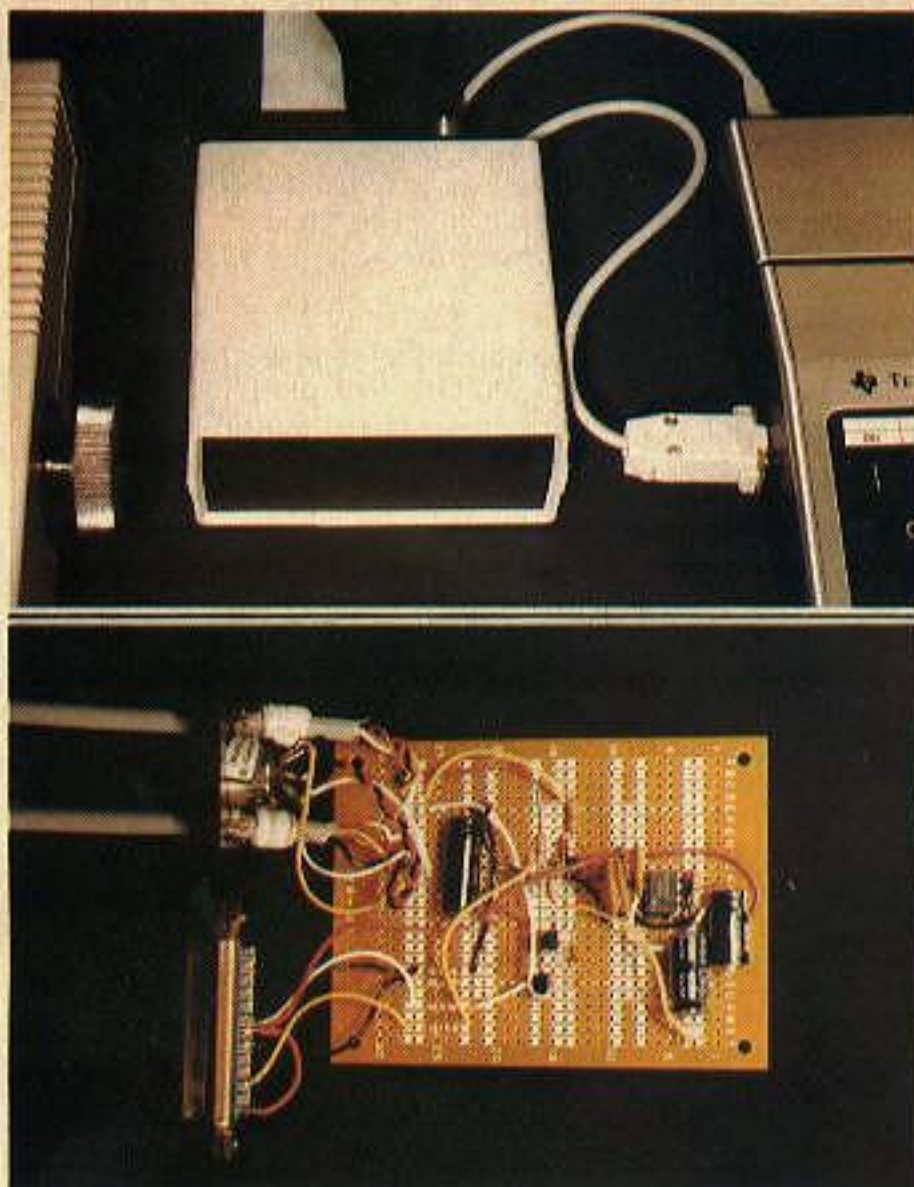


Figure 1



Top photo: Joytalk, installed between a printer and the Home Computer.
Bottom photo: The completed Joytalk interface, minus the case.

plementing the RS232 output function requires three basic blocks:

1. A negative supply voltage to generate the negative voltage levels as required by the RS232 standard.
2. Circuitry to translate the joystick select level to RS232 compatible levels. It is necessary to maintain the RS232 serial output at an inactive level when the joystick select is inactive. This requires that the joystick select level be inverted; otherwise the remote device will see continuous start bits. Since RS232 levels are bipolar (see Figure 1), the inverter stage should have a bipolar output.
3. Finally, some circuitry is needed to translate the printer busy signal to a level which moves between Hi-Z and ground, and is also compatible with the scan matrix levels. If the "device busy" is asserted when the keyboard is being scanned, improper results will be returned. Therefore, the busy signal needs to be gated onto the scan matrix only when it needs to be checked. The remaining joystick select is used for gating control.

The completed hardware design is shown in Figure 4. A look at this schematic reveals the details of the design. The negative voltage supply is generated using a charge-and-dump technique. At the heart of the design is a 555 timer (IC1) free running at approximately 30 KHz. On the positive half of each output cycle, "bucket" capacitor C3 is charged through D1. When the output transitions to ground, D1 turns off and D2 turns on, allowing C3 to "dump" part of its charge into C4. C4 holds the negative voltage level while C3 is recharging.

For the RS232 output, both level translation and inversion must be performed. A common-emitter circuit consisting of Q3, D3, R3, R4, R5 forms an inverter with bipolar output levels. When the joystick select (J51) is inactive (+4v), Q3 should be off, and the RS232 output will be negative (Figure 1). An active (0V) joystick select should turn on D3 and Q3, raising the RS232 output voltage to +11, allowing for voltage of approximately 2 volts. This is the desired threshold voltage,

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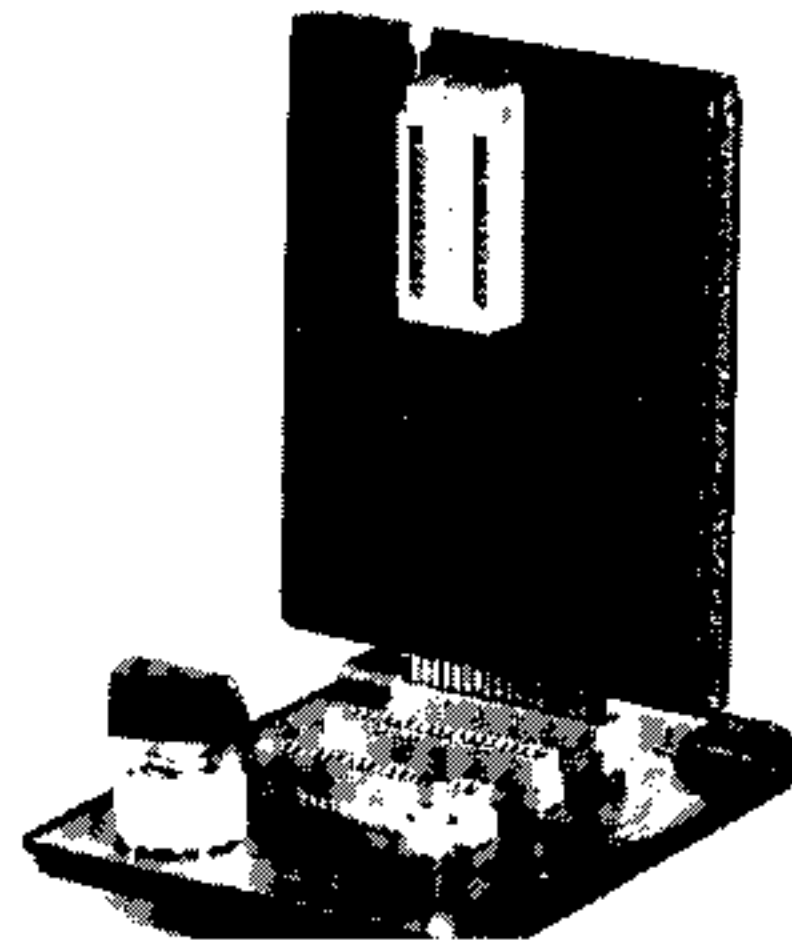
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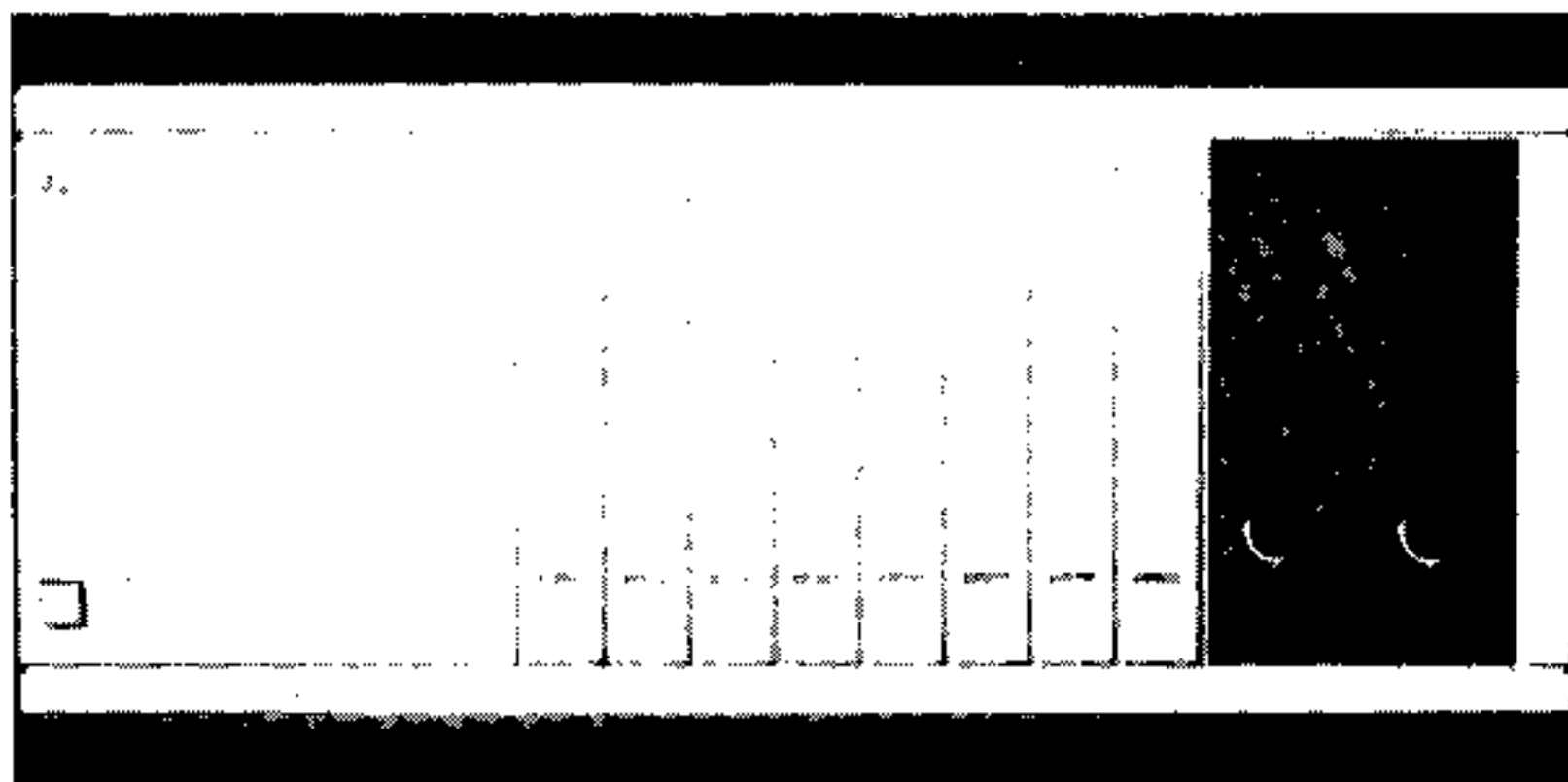
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because it is midway between the joystick output levels. R4 protects Q3 from output shorts, while R3 limits zener current.

Finally, Q1, Q2, D4, R1, and R2 buffer and gate the busy signal. Q2 performs the gating function by keeping the collector of Q1 in the high impedance state if the JS2 output is inactive (high). When JS2 is active (low=0V), Q2 turns off allowing the busy input level to ground. The DOWN joystick level is inverted from the actual RS232 level.

Construction Notes

All of the wire needed to construct the project was obtained from one six-foot cable (5-pin DIN to 5-pin DIN) purchased at Radio Shack (Cat. number 42-2151). Starting at one end of the cable, the connector with about 9 inches of cable was cut off to be used for connector J2 as shown in Figure 2 (plugs into the TI-99/4A monitor jack). From the same end of the cable, a 10-inch section of cable was cut off for use with the 9-pin D-type connector (plugs into the joystick port). At each of the three ends, about an inch of the thick outside cable jacket was carefully cut away from the wires inside. There are four wires inside—red, white, black, and yellow. Each wire is wrapped in fine copper wire strands. Unwind the strands from each wire and cut off all of them except for one set which should be carefully twisted into a fifth wire. To obtain wire for hooking up the components in the box, cut another 20" section of cable. Carefully cut away the entire outside grey jacket from this section, unwind the copper strands from the four colored wires, and discard the strands.

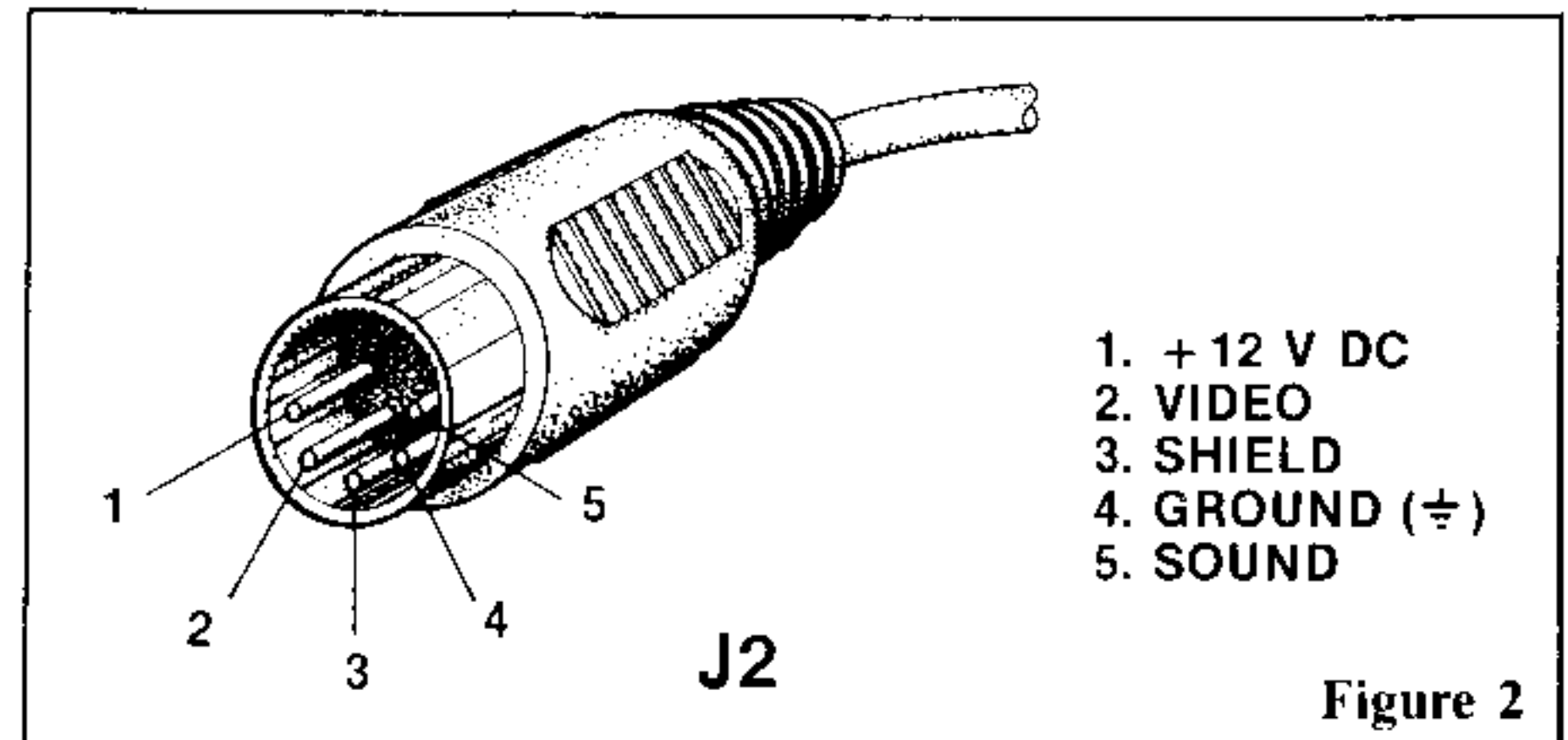


Figure 2

Step two in the construction phase consists of cutting the holes on the back plate of the Radio Shack case (Cat. number 270-218). Follow the hole-drilling template in Figure 7 (see p. 71). Drill very gently so the plastic plate does not crack. Using 4-40 screws and nuts, fasten the connectors J3 and J4 into their respective holes. Be sure to place the connectors through the mounting holes from the outside of the plate. Then pass the prepared cable end of the 5-pin DIN male connector through the plate marked for J2 in Figure 7. Lay the panel aside for now and prepare the J1 connector cable assembly. Connect the wires as shown in Figure 3. (Note that even though only three wires are required, all five connections are made; this adds strength to the cable and does not affect the operation). Pass the free end of the J1 cable through the hole for the J1 cable in the rear panel. The rear panel is now ready to be attached to the circuit board.

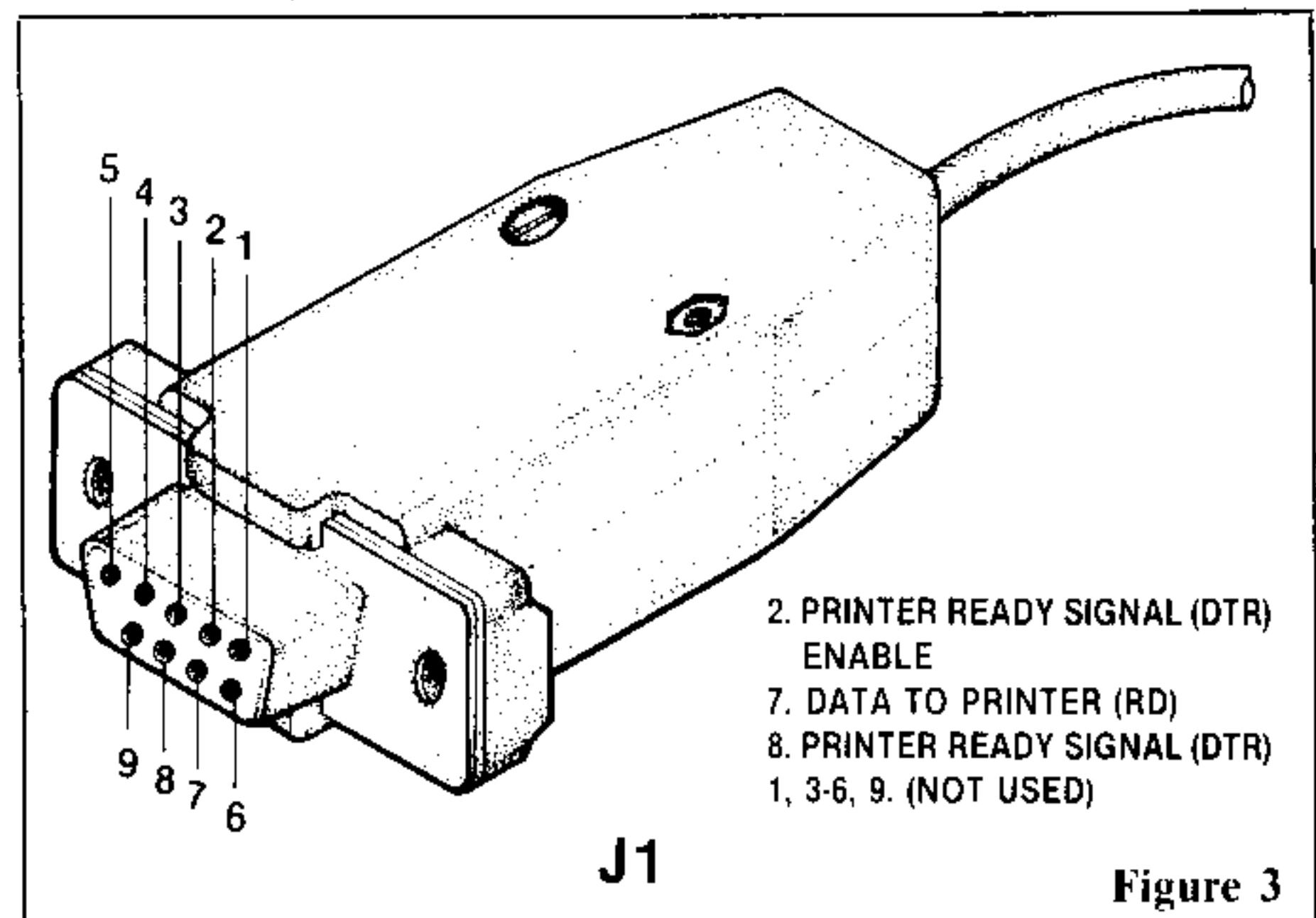


Figure 3

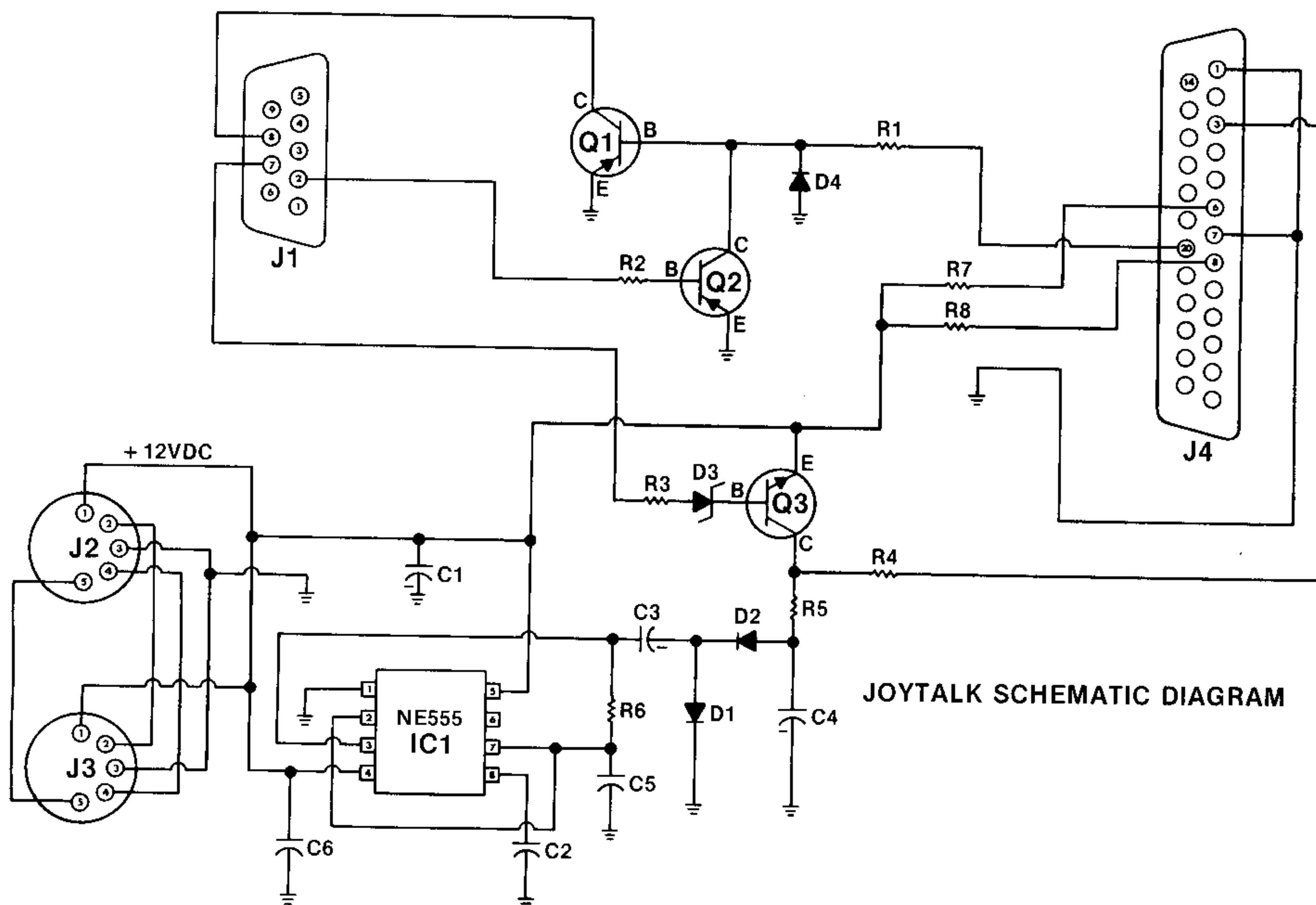


Figure 4

PARTS LIST FOR JOYTALK

SCHEMATIC SYMBOL	QTY	RADIO SHACK PART NO.	DESCRIPTION
J1	1	276-1538	D-Subminiature female 9-position connector
J2	1	276-1539	9-position D-Subminiature connector hood for above
J3	1	42-2151	6-foot 5-pin to 5-pin DIN cable (use one end)
J4	1	274-005	5-pin chassis socket DIN type
IC1	1	276-1548	D-Subminiature female 25-position connector
Q1, Q2	2	276-1723	Integrated Circuit Timer (NE555)
Q3	1	276-2016	NPN transistor (2N3904)
D1, D2, D4	3	276-2034	PNP transistor (2N3906)
D3	1	276-1620	switching diode (1N914)
C1	1	276-562	9.1V zener diode (1N4739)
C3, C4	3	272-1016	100 uF/35v electrolytic capacitor
C2, C5, C6	3	272-1015	47 uF/35v electrolytic capacitor
R1, R2	1	272-135	0.1 uF disk capacitors
R4, R5, R6	1	271-1328	3.3K ohm, 1/4 watt resistor
R7, R8	7	271-1317	470 ohm, 1/4 watt resistor
R3	1	270-218	Deluxe Plastic Enclosure (2 1/8" x 5" x 5 1/4")
(optional)	1	276-1995	8-pin low profile socket (for NE555 IC)
	1	276-162	IC-LSI Periboard (for mounting circuit parts)
	4	64-3011	4-40 x 1/4" steel round head machine screws
	4	64-3018	4-40 steel hex machine screw nuts
	1	64-2801	Science Fair Electronic Tool Set (includes 30 watt soldering iron, needle-nosed pliers, wire cutters, screwdrivers, etc.)

[A version of the JoyTalk device is available in a more compact design as a commercial product from one of our advertisers. JOYPRINT (tm) is offered as a finished product from Model Masters at 25128 E. Fender Ave., Fullerton, CA 92631. The suggested retail price for JOYPRINT is \$59.95 (for those of you unwilling to endure the experience of building JoyTalk from scratch). —Ed.]

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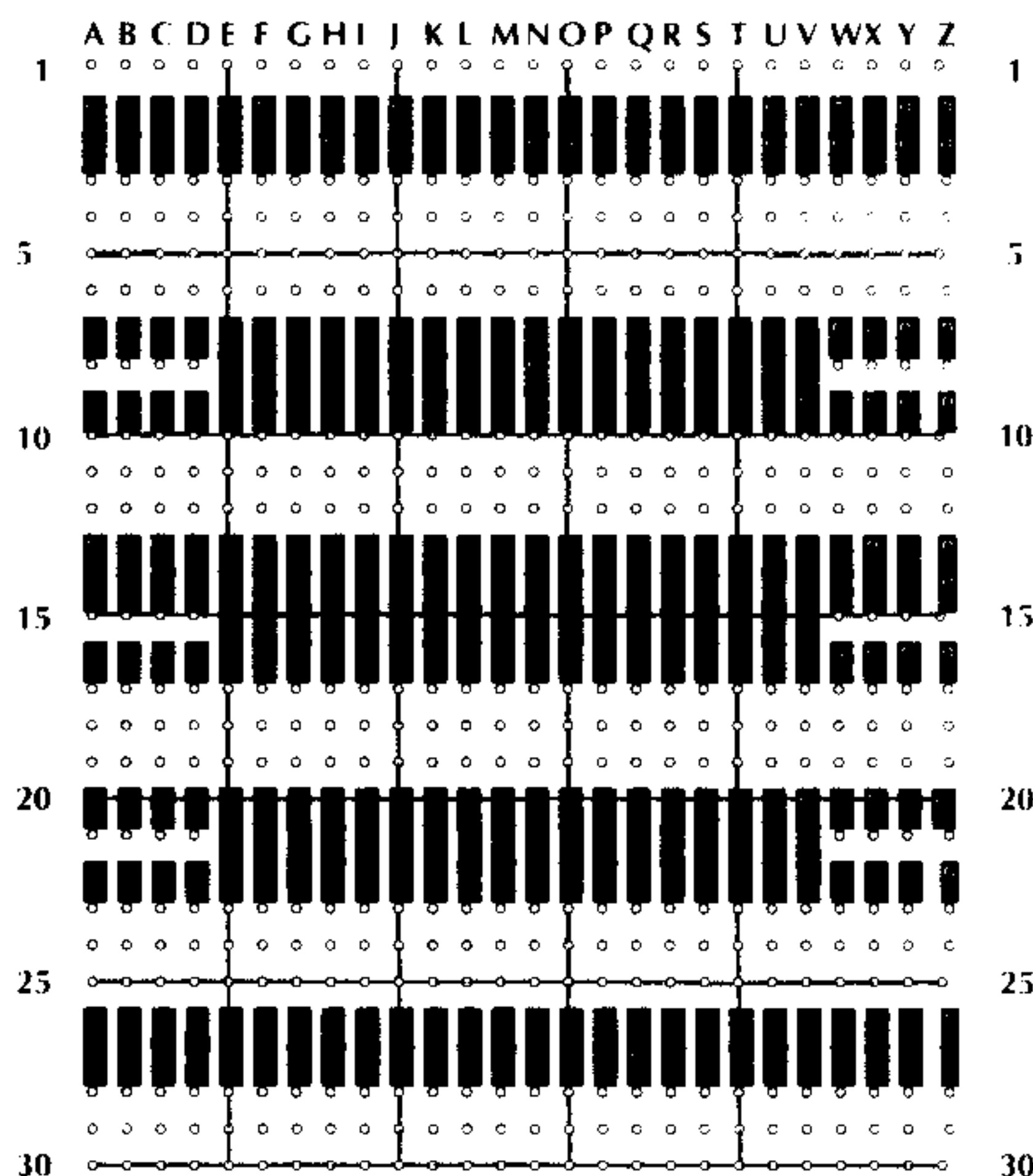
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JOYTALK CIRCUIT BOARD

Figure 5

The Radio Shack circuit board (Cat. number 276-162) has a grid of holes, predrilled on tenth-inch centers. On one side of the board, copper foil "traces" connect certain holes in the grid. This side is called the *solder* side of the board. The opposite side is referred to as the *component* side (it has white printed markings on it). Each side is labeled with numbers down the side and letters across the top (see Figure 5). Thus, any hole on the board grid can be

referenced by a number and a letter (e.g., the 10G location in the point-to-point wiring chart (Figure 6) which may be used with the schematic as an aid in construction).

Next month, we continue with the actual Assembly Language program for Mini Memory that will make this hardware come to life. Also, a simple test routine will be presented. Until then, good luck and have fun!

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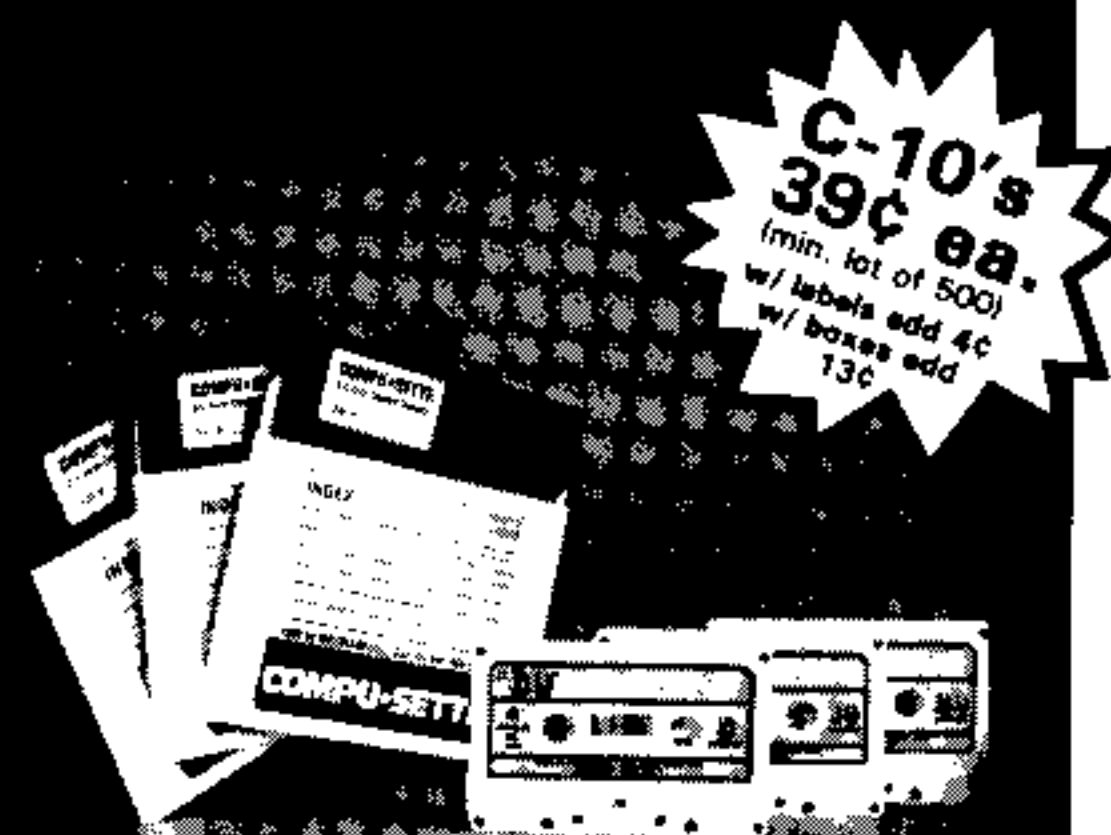
*T.I. Editor/Assembler manual recommended—may be ordered from T.I.

Figure 6 JOYTalk POINT-TO-POINT WIRING CHART

FROM GRID LOCATION	LEAD OF COMPONENT	COMPONENT	LEAD OF COMPONENT	TO GRID LOCATION
2L	END	C3	END	3M
3L	END	R6	END	8L
2M	END	JUMPER	END	8N
3K	END	JUMPER	END	7L
3N	END	JUMPER	END	2Y
2O	END	C4	END	3I
3O	BLK	D1	CLR	4Y
4T	BLK	D2	CLR	14M
3Y	END	JUMPER	END	3N
3O	END	JUMPER	END	8J
8I	END	JUMPER	END	8K
8I	END	C2	END	9L
9J	END	C5	END	10N
10J	END	C6	END	14K
9N	END	JUMPER	END	20O
10I	END	JUMPER	END	
4K	PIN4	IC1		
4L	PIN3	IC1		
4M	PIN2	IC1		
4N	PIN1	IC1		
7K	PIN5	IC1		
7L	PIN6	IC1		
7M	PIN7	IC1		
7N	PIN8	IC1		
13D	END	R3	END	13G
13I	COL	Q3		
13I	BAS	Q3		
13K	FMI	Q3		
13O	CLR	D4	BAR	13I
14D	END	JUMPER	END	26D
14G	CLR	D3	BAR	14I
14O	END	JUMPER	END	14S
15I	END	R5	END	15M
15O	FMI	Q2		
15P	BAS	Q2		
15Q	COL	Q2		
15S	FMI	Q1		
15I	BAS	Q1		
15U	COL	Q1		
16B	END	R2	END	16P
16Q	END	JUMPER	END	16I
17B	END	JUMPER	END	26B
17I	END	JUMPER	END	22X
17K	END	JUMPER	END	21E
17O	END	JUMPER	END	21O
17T	END	JUMPER	END	22V
22E	END	JUMPER	END	22S
22O	PIN7 + 1	J4		
23E	END	C1		23O
23S	END	R7	END	26S
23I	END	R8	END	26I
24V	END	R1	END	26V
23X	END	R4	END	26X
27C	PIN1	J3		
27H	PIN2	J3		
27I	PIN3	J3		
27J	PIN4	J3		
27K	PIN5	J3		
27S	PIN8	J4		
27I	PIN6	J4		
27V	PIN20	J4		
27X	PIN3	J4		
28A	PIN1	J1		
28B	PIN2	J1		
28C	PIN4	J1		
28D	PIN7	J1		
28E	PIN8	J1		
28G	PIN1	J2		
28H	PIN2	J2		
28I	PIN3	J2		
28J	PIN4	J2		
28K	PIN5	J2		
23I	END	JUMPER	END	26C
23O	END	JUMPER	END	26J
23S	END	JUMPER	END	23I

Continued on p. 71

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99/4H... from p. 9

resources but also the time for individualized computer instruction. But the 4-H group provides two full hours a week of individual computer time, with a student-tutor ratio of no more than three to one. Even in after-school computer clubs, teachers can seldom provide this kind of attention.

Ideal Classroom Situation

Rice compares the 4-H group to "the ideal classroom situation." Having taught school for 16 years, he knows the advantages of the 4-H learning situation. Besides the low student-tutor ratio, kids here enjoy a program that is "locked into individual needs rather than administratively-defined learning objectives." Kids work on 4-H projects not because they have to, but because they want to. In addition, they benefit from the real-world experience of people like Figg and Lee Galen, a parent volunteer who has worked in the data processing field for 20 years.

Eighteen-year-old Klaus Neubert, an unofficial project consultant for the 4-H group, is helping put together a dictionary to introduce kids to computer jargon and technical terms. Now a high school senior, he's already taken college courses in data processing. He says he was always a little bored with "teaching your dog how to walk" in other 4-H groups, but computers are something he is excited about. He's as comfortable with an Apple or a mainframe terminal as most people are with their television sets. And now he's getting acquainted with the TI-99/4A.

A Practical Approach

In good 4-H tradition, Figg and Rice are taking a practical approach to teaching computers. In the second session, they have kids type in a program that can be used to track a burgeoning brood of bunnies, including everything from number, sex and color to feed consumption and net profit. Kids who have used other computers at their schools need time to adjust to the idiosyncrasies of the TI-99/4A and unlearn some of the programming habits they've acquired on other machines. And through the tracking exercise, explains Figg, the children are not only getting acquainted with the keyboard, but picking up the meaning of INPUT, DATA and PRINT statements as well. They're also learning what Rice considers a most important lesson—that computers are useful tools that can be applied to many activities in everyday life.

The real-life emphasis is what distinguishes the 4-H program from school programs in computer literacy. In addition to learning practical applications from the start, the 4-H group takes frequent field trips to computer installations to mingle with professionals in the field. The group has already taken trips to mainframes at the University of Washington and toured the installation at the county courthouse. Other visits are planned for the future. Tips on how a leader can plan and carry out field trips like this will be included in leader manuals for computer projects. Offering this kind of information—something most schools have never provided—is an integral part of the 4-H philosophy.

Computers and Agriculture

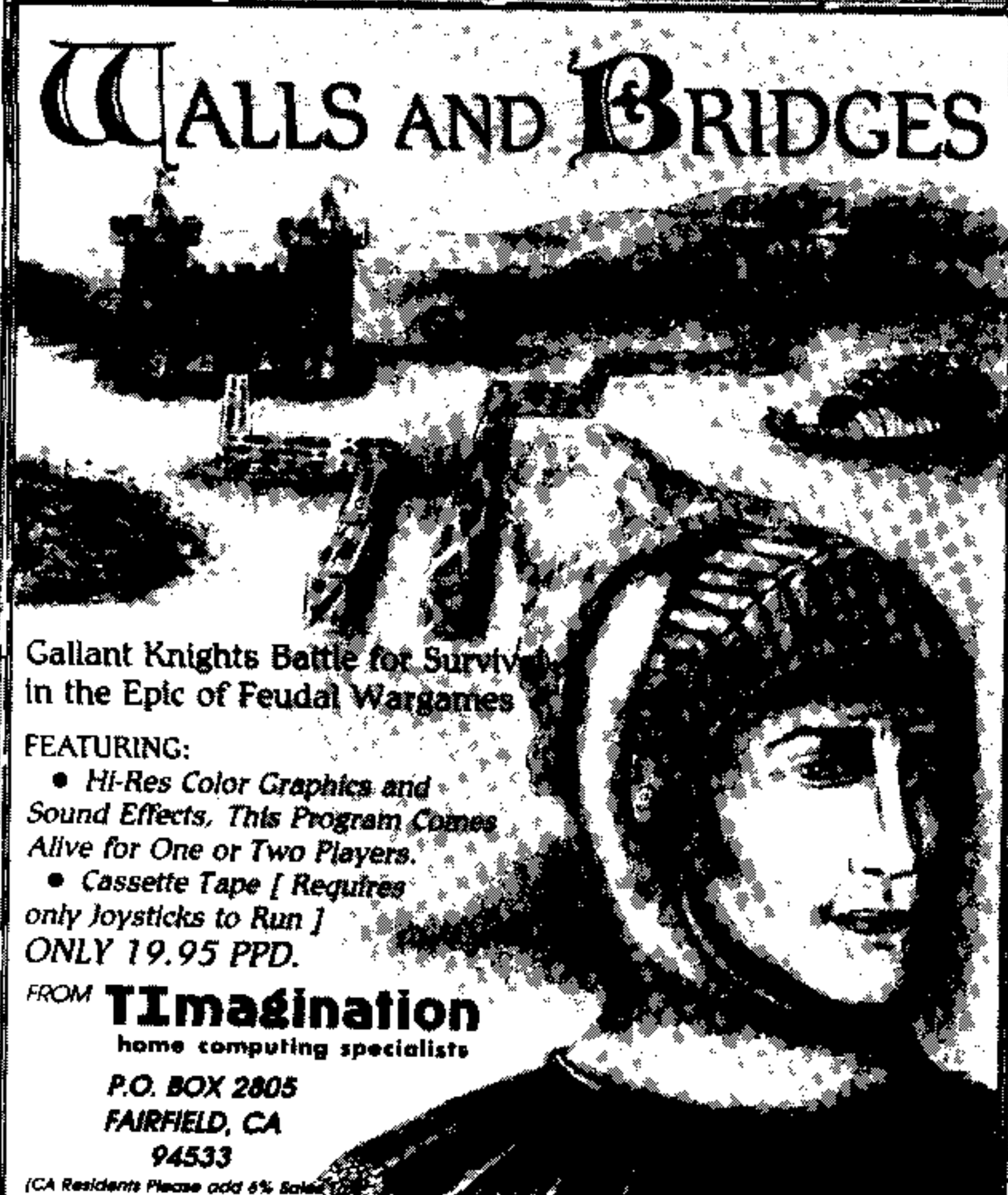
Rice says the computer project actually has three goals: to develop users' skills (with emphasis on educational and agricultural software), to teach programming skills, and to provide an example for the agricultural community. "Sometimes I think what we're really into is selling the idea of computers," says Rice, who is hoping to have three computer stations, set up and operated by 4-H kids, at the county fair in August.

Rice hopes that by demonstrating the usefulness of computers at the fair, these kids will be able to draw farmers and rural people into a technology he considers more revolutionary than the invention of the wheel. Actually farmers already show a high degree of acceptance of the new technology. Their healthy survival instincts, honed through the Industrial Revolution, are now pushing them confidently into the microcomputer market.

Rice's enthusiasm for computers and agriculture is boundless. He sees the computer as a link eventually joining everyone from the professional dairyman and the university agricultural researcher, right down to the 12-year-old 4-H member raising rabbits in her back yard.

Continued on p. 70

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Complete-up to date, includes pin-out of all ports, memory map & CRU address lists, timing & electrical data: diagrams.

- | | | |
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| 1) TI-99/4A..... | \$29.95 | ALL 3 SETS |
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Alphacom has introduced what the company believes is the industry's lowest cost 40-column printer with graphics capabilities for home and personal computers.

The unit prints 2 lines per second and is priced at \$179.95. It is packaged in the same light-weight, impact-resistant Alphacom 40 enclosure that recently won an "Excellence of Design" award from *Industrial Design* magazine.

Alphacom has developed a cable interface approach that permits the same Alphacom 42 printer to be linked to most brands of home computers by simply using the appropriate interface cable.

Among the printer's features are upper and lower case letters, a wraparound facility that allows printing of text lines longer than 40 characters, and an ability to recognize standard ASCII control or action codes for changing the printing mode. Codes include carriage return, line feed, right justification, form feed, graphics control, and multi-line feed.

The Alphacom 42 printer at \$179.95 is ready for immediate shipment. Interface cables for the TI home computers are expected to be ready this quarter, 1983. Cable interface prices begin at \$29.95.

For further information, contact the Consumer Sales Department, Alphacom, Inc., 2323 South Bascom Avenue, Campbell, California 95008, (408)559-8000.

CORNER DRUGSTORE CONVENIENCE AND PRICES

Star Micronics, Inc. has introduced a "corner drugstore" ribbon replacement, an under-\$200 thermal printer, and an under-\$500 daisy-wheel printer.

The company has designed its Gemini-10 and Gemini-15 printers to use standard typewriter ribbon spools so that a customer will be able to replace a ribbon at the corner drugstore or an all-hours convenience store. The Gemini printers also feature additional fonts, larger built-in buffers, and removable tractor feeds with a wide range of adjustments. Suggested U.S. price for the Gemini-10 is \$399 and for the Gemini-15, \$645.

Star Micronics is also bringing out a new thermal printer peripheral for desktop personal computers with a suggested U.S. price of \$199. Features of the stx-80 include both bit-image and block graphics, European characters, and bi-directional, logic-seeking printing of 80-character lines (40 characters per line in expanded print modes) at 60 characters per second.

The Dallas company is announcing July, 1983, delivery of its daisy-wheel printer at a suggested U.S. price of \$499, with details to be announced soon.

For more information, contact Star Micronics, Inc., 1120 Empire Central Place, Dallas, Texas 75247, (214)631-8560.

GRAPHIC DESIGN AIDS FOR THE TI-99/4A

TENEXTM Computer Marketing Systems, Inc. has developed two forms which aid the 99/4A programmer in graphics design. The Screen Graphics sheet (TNX 5300) divides the monitor screen into 32 columns and 24 rows, allowing simple layout and location of text and characters. Another scale divides the screen into 256 columns and 192 rows, so the more advanced programmer can easily define sprite coordinates.

A second sheet, the Character Definition graphics form (TNX 5400), displays a four-character by four-character matrix which can be used to define any graphic design, even the largest sprite. This form also contains a pixel-to-hex code conversion chart and space for writing program statements.

Each form is available in a 40-sheet pad for \$1.95 each from TENEX Computer Marketing Systems, Inc., Box 6578, South Bend, Indiana 46660, (219)277-7726.

COMPUTER CAMP FOR THE WHOLE FAMILY

Craig Hall Complex and the Texas Instruments Learning Center have joined forces to put together a unique Computer Camp for all ages in Chico, California this summer. The Computer Camp will offer classes for children ages 7-17, as well as computer literacy classes for adults. No prior computer experience is necessary to attend. The family is provided a unique opportunity to be introduced to the new world of the personal computer together, or the family can share a residence while the adults vacation and the students enjoy a computer camp atmosphere.

Texas Instruments' team of professional instructors and outside consultants will conduct all courses. Craig Hall will handle all the traditional aspects of the camp, providing the facilities, professional camp director, and counselors. The director and counselors are college-trained experts carefully screened for their knowledge and understanding of the various age groups. They will provide 24-hour, on-site supervision and conduct all traditional camp activities.

Craig Hall is an 850-bed student resident living facility, situated on an eleven-acre site with full recreational facilities, including an olympic-sized swimming pool, tennis courts, volleyball, game rooms, and a TV lounge with a 6-ft TV screen. Three nutritious meals are served daily.

For more information, contact Mary Ann Perolio, CTC, Conference Coordinator, Craig Hall Computer Camp, 1400 West Third Street, Chico, California 95926, (916)345-1393 or Susan Michaels, Assistant Manager, Texas Instruments Learning Center, 5353 Betsy Ross Drive, Santa Clara, California 95054, (408)988-3481.

COMREX DAISY-WHEEL PRINTER FOR PERSONAL COMPUTERS FOR UNDER \$700

The ComRiter CR-II from Comrex retails for under \$700 and offers features usually found in more expensive printers—superscript, subscript, backspace, underline, boldface, double strike, and proportional spacing. The new printer also features a 5K buffer that allows a user to reproduce original and multiple copies of documents stored in its memory. The buffer can store up to three pages of data. The ComRiter can be operated in a word-processing mode by simply selecting the Diablo 630 SPI protocol, available in most word-processing software.

The ComRiter prints at an average speed of 12 characters per second; print motion is bi-directional and logic-seeking. Two standard interfaces are available: Centronics parallel and RS232C serial. Optional features include tractor feed, color print ribbons, a cut-sheet feeder, and interchangeable print wheels compatible with the Comrex CR-I ComRiter daisy-wheel printer.

In addition to its two daisy-wheel printers, Comrex markets a line of color and monochrome display monitors and will introduce several more input, output and storage peripherals for personal computer users this year.

For more information, contact Robert J. Pearce, Comrex International, Inc., 3701 Skypark Drive, Torrance, California 90505, (213)373-0280.

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CompServ offers a desktop computer stand of sturdy construction with a stained, polyurethane finish. Weighing about 35 lbs., the stand provides room on top for a 13" TV and expansion box and room underneath for a computer console. The stand will also store up to 50 cassettes, modules, or computer manuals. The cost is \$25 plus shipping and handling.

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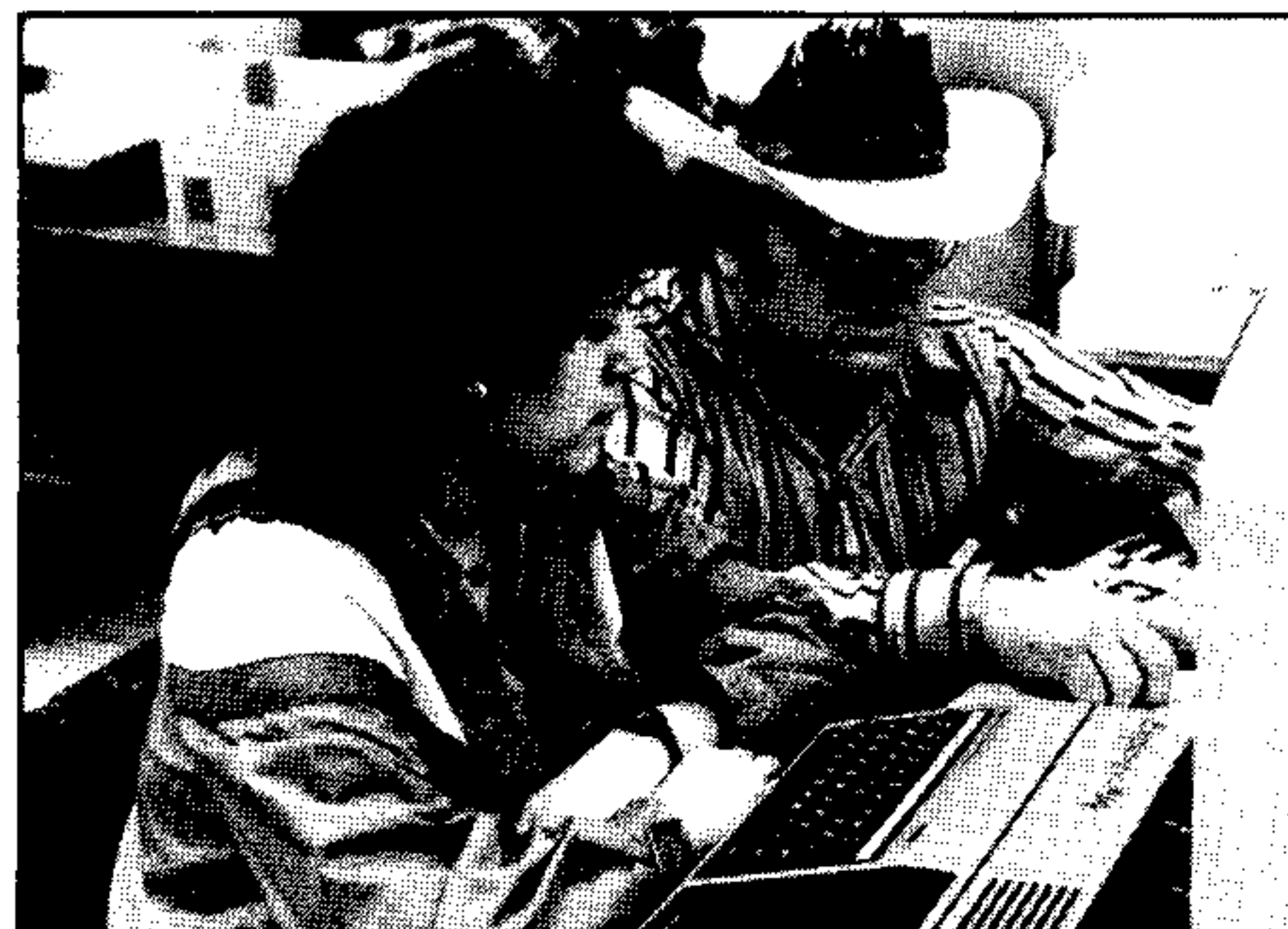


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99/4-H... from p. 68

Although county agents are already part of a large agricultural computer network, individual 4-H groups don't have that kind of access yet. But Rice envisions an eventual computer network/data base focusing on the many common interests of the agricultural community—crop rotations, fruit tree spraying schedules, fertilization techniques and, of course, educational activities for children.



Lee Galen, with 20 years of data processing experience, enjoys sharing some of his computer expertise with 14-year-old Lydia Venegas. Using the school district's computers, 4-H group leaders are able to provide kids with quality one-on-one programming instruction.

Time, Money and Expertise

Some 4-H clubs are beginning to use computers on a small scale to help organize the flood of data involved in their day-to-day management. Ginger Holser, a 4-H leader in Snohomish County, is using a computer to keep track of horse-judging scores. As computers become increasingly available to 4-H leaders, they'll be finding more and more of these practical applications.

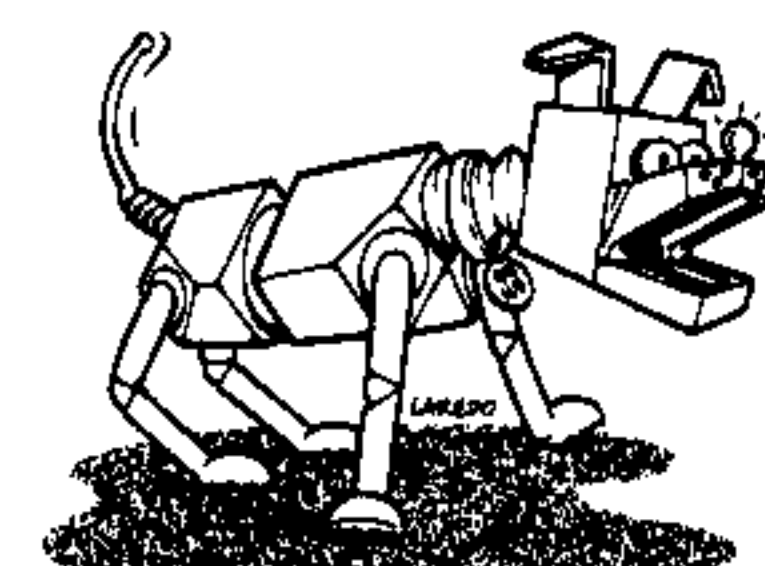
Computers, 4-H and agriculture have a real future together. But lack of money is a big deterrent to the development of their interests in common; 4-H programs are supported only partially by federal funds, allocated by the state. Little money is available for project development and even less for the purchase of equipment. Figg and Rice are exploring the possibilities of funding through special grants and writing to local businesses for contributions.

A lack of qualified leaders is also a problem. Although Rice's group is more than adequately staffed, in Marysville (25 miles to the north) there are kids who want to learn and computers to learn on, but no qualified volunteers to teach.

Providing a whole generation of children with computer literacy and training for a computer-based society is a big job that schools, so far, aren't able to handle without help. The 4-H, with its limited resources, can't do it alone either. But as more and more organizations gain access to computer equipment and programming skills, we can expect to see the job increasingly shared by all segments of society. As this happens, we will begin to see that the computer, long feared as an isolating force in our society, can instead serve to draw us together in common goals and bridge communications gaps between us.

*(Best Article-Reader's Choice)

Let us know what you like by voting for your favorite article or program in this month's 99'er Home Computer Magazine. Fill out the removable B.A.R.C. BACK response card on the bottom of the 99'er Questionnaire and mail it in. (There is no need to fill in the 99'er Questionnaire again, if you have already done so.) Let your voice be heard—the winning author will receive a bonus of \$100.00!



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— 99'er Magazine (March '83, page 21)

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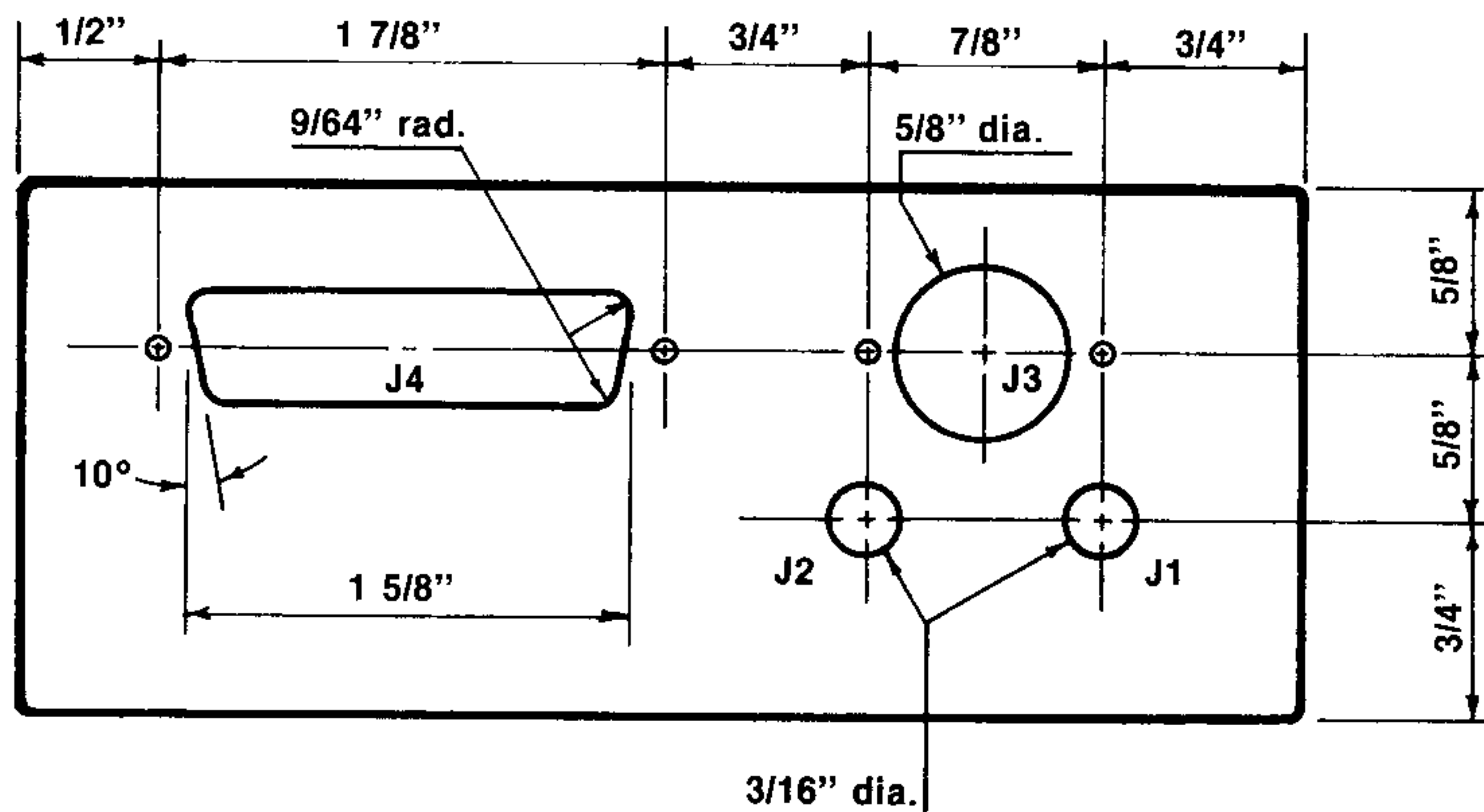
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JoyTalk . . . from p. 67



BACK PLATE DRILLING TEMPLATE

Figure 7

Straight Flush . . . from p. 23

game to a crawl. For these reasons, we recommend that *Challenge Poker* be played alone.

What's the Score?

At first, deciphering the score was as much a challenge as playing the poker part of the game. After a bit of figuring, however, the system became clear. Each row and column is represented to the right of the game board by its corresponding letters and numbers. The two diagonal scoring possibilities are indicated also (under short diagonal lines). Under the appropriate column/row symbol you will find your scores for each "hand" on the gameboard. The computer enters the separate scores for the on-going subtotals (ST) and the total point score (TOT) for all rounds below the column/row scores. The screen also keeps the message PLACE CARD, [Joe or Mary] on at all times. This lets you know immediately whose turn it is.

eliminating the confusion that could result from the multiple game boards.

Playing Ease

It may take a while before you get into the triple digit scores, but *Challenge Poker* is an easy game to learn. The documentation is easy to understand, covering everything from loading (a modicum of loading know-how is assumed) to scoring and ending the game. The directions fail to mention one important point, however: In order for the program to run, you must either use a minimal system, or type in CALL FILES (1) prior to loading the program. If you don't, you will get a MEMORY FULL message instead of a game. Also, I personally would have appreciated a handy definition list of Poker terms, but most game players probably already know what a straight, flush and full house are (they can also be found in the dictionary). Errors are not a problem with this game. If you make a mistake in enter-

ing your row or column number, you simply key it in again; nothing is final until you press ENTER.

Challenge Poker is not a game in which graphics take center stage, but the visual effects are bright and easy to understand. The game board is well designed with colorful, clear card faces and scores prominently displayed. There is also a nice victory tune when you complete a "winning row," and it plays twice if you score in two directions at once.

So if you are looking for a solo game that is long on strategy and short on bells, lights and buzzers, *Challenge Poker* may be your game. If you are looking for a game to sharpen your Poker-playing skills in the privacy of your own home, it is definitely your game. You won't need to round up a foursome, and you can bluff (or cheat) to your heart's content. But remember the old adage: The man who cheats at Solitaire has a chump for an opponent.

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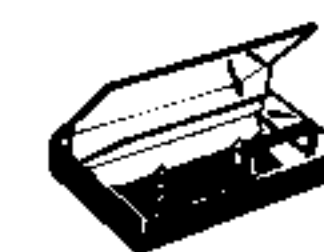


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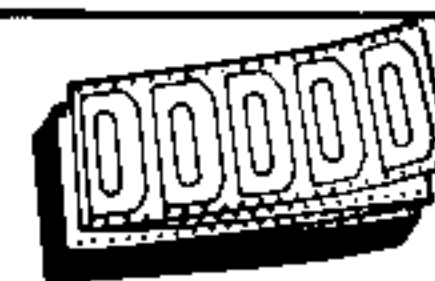
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LOGO Letter... from p. 59

vanced LOGO projects, such as a simple artificial intelligence learning program. The manual is not as simple to read as the first one since each serves a slightly different audience. Dan notes in his manual those features which are unique to LOGO II. With its extra pages, the Watt manual includes some "kluges" or "hacks" that program around problems in LOGO, such as the somewhat awkward problem of testing for an empty word. (There is no null word in TI LOGO, but a word with just one element can be detected since the FIRST of it is equal to the whole of it.)

List and word handling is made easier with the primitives of REVERSE (which outputs the reverse of a word or list input) and ROTATE (which outputs the word or list input with the first element rotated to the end). The bug that occurred when you typed BUTFIRST "A (or any other one-element word) and got TELL ME WHAT TO DO WITH A for your next several error messages seems to be corrected, as is the CHOKE that used to result from recursive programs adding elements to words. Shapes can now grow twice their usual size with the command BIG (which makes them 32 by 32 turtle steps large) or shrink to their original size (16 by 16 turtle steps) through the command SMALL. As well as I could determine, the Turtle still runs out of ink after using about 190 tiles. Although this can be quite annoying with drawings in which there are a lot of horizontal or

vertical straight lines, you can hack around the problem by designing a horizontal or vertical character on tiles and then using a PUTTILE command inside a recursive program with appropriate stop rules. For example:

```
TO LINE :X :Y
  IF :X > 30 STOP ;or change X back to
    0 and increment Y
  PT 255 :X :Y
  LINE :X + 1 :Y
END
```

It may seem strange to start talking about LOGO III while waiting for an outstanding LOGO II, but by its very nature as a growing procedural language, LOGO invites improvements. In three or four more years LOGO III may be at our disposal, using the voice synthesizer or even LISTENing to spoken commands. It may have floating point arithmetic* or expanded turtle graphics. I am encouraged that TI did not simply sell the original LOGO until it had exhausted the market, but instead pursued the improved LOGO II. As soon as I returned from TCEA, I increased my order (placed last November) from 12 to 15 Command Cartridges.

Sincerely,
Henry Gorman, Jr.

* Roger Kirchner argues that this is not necessary, and he has a program which allows for floating point in the original LOGO.

97er

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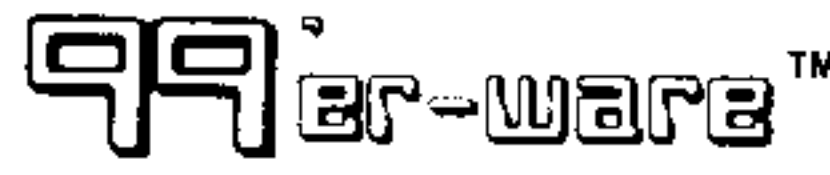
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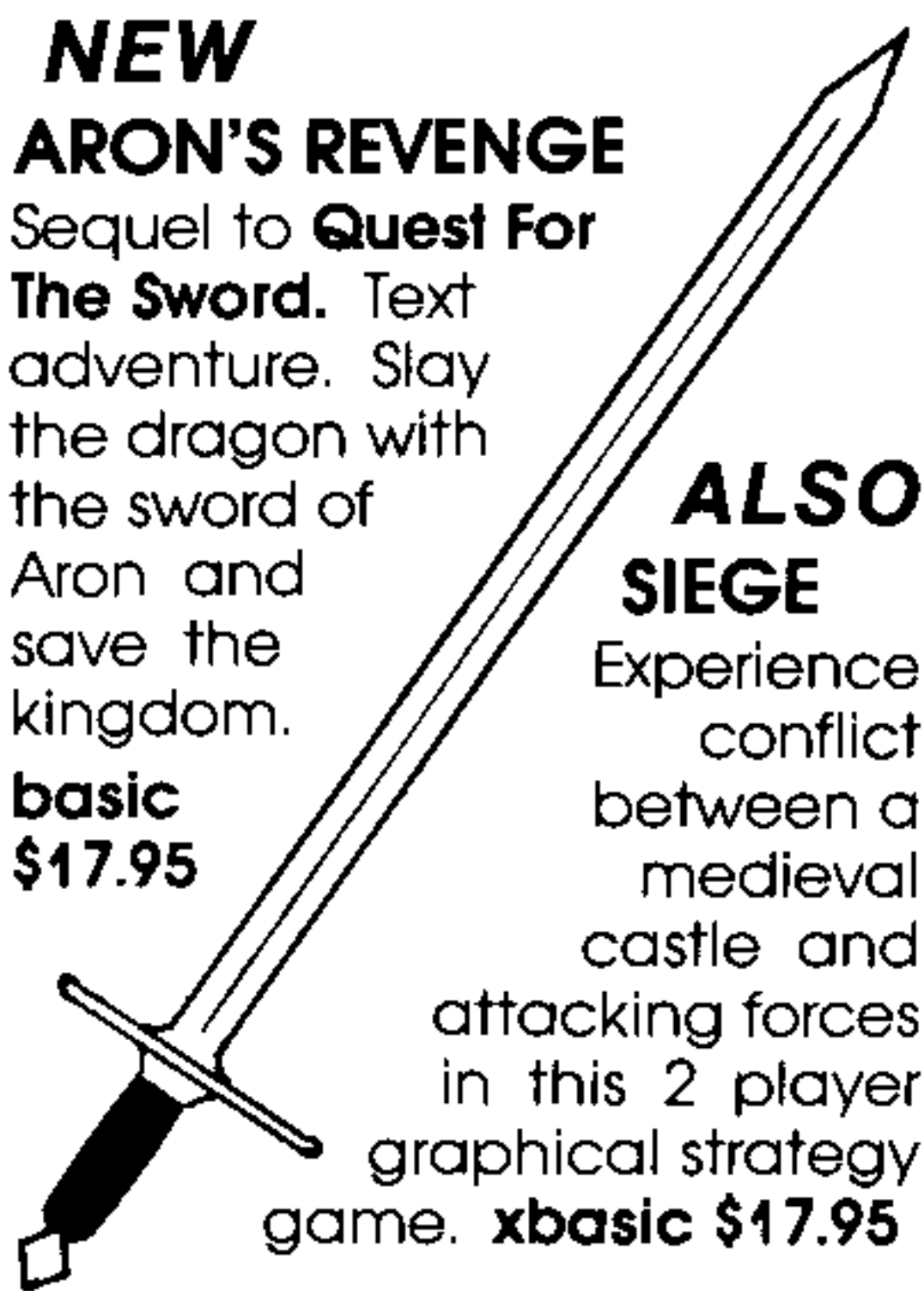


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Eight Easy Pieces . . . from p. 60

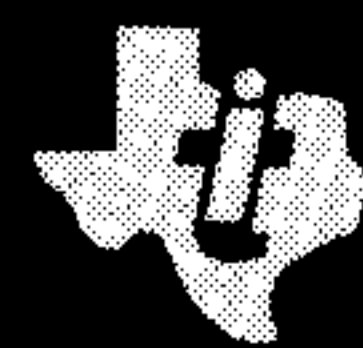
Despite these flaws, the programs are geared to be extremely easy to use and yet provide more difficult levels once a task has been mastered. *Early Counting Fun* "graduates" can move on to *Shark Counting* or *Fish and Count*. Those who tire of *Keyboard Trainer* can progress to *The Talking Typewriter*, a more interesting game in which the Speech Synthesizer pronounces letters, words and whole sentences that the child keys in. While I am not sure exactly how long this game will occupy a child's interest, I can say that it managed to occupy several editors in this office for a good part of the afternoon.

What Does It Teach?

The exercises in this package concentrate on the most basic skills—letter and number recognition, counting, addition and subtraction. In *Count and Fish*, there is an *automatic mode* in which a child simply learns to operate the joystick. Children can progress from matching letters on the screen with letters on the keyboard, to writing full sentences in *The Talking Typewriter*. It should be noted, however, that an exercise such as *The Talking Typewriter*—in which the Speech Synthesizer merely reads whatever letters or words are fed in—does not really *teach* anything more than letter recognition. Students must already know how to spell the words they key in. (The program will not correct spelling errors.) It should also be explained to them that sometimes the computer has a slight "speech impediment" and may pronounce words (even correctly spelled ones) a bit strangely.

The Talking Typewriter would be more effective if there were a feature—which we have seen in other programs of this type—whereby the pronunciation could be corrected by spelling in difficult-to-pronounce words phonetically (then linking the phonetic pronunciation with the correct spelling). This way a *Sean* or *Phoebe* could have the pleasure of hearing their names pronounced correctly when they are

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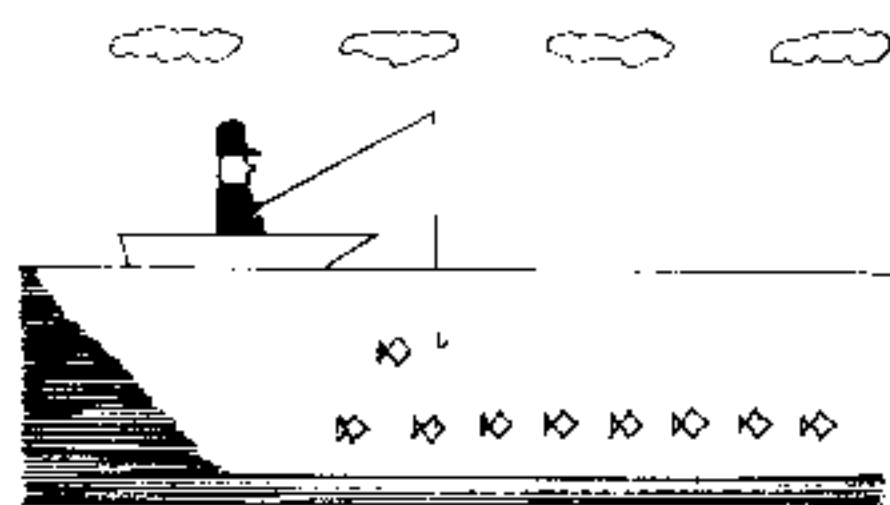
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spelled in. With proper encouragement and support, this program can provide a strong incentive for students to compose words and sentences.

The skills that these programs focus on are of the most essential sort; the skills children *must* master if they are to move on. *Upper Room* is also planning to introduce software that will cover such skills as color recognition, directions and prepositions (up, down, over, under, etc.) sometime in the future.

Is It Simple to Use?

Although the documentation for these programs is quite extensive, we found it somewhat unclear and difficult to use. Instead of presenting the pertinent information—language, program name, equipment needed—clearly at the beginning, the directions for each module have to be read in full. Also, the introduction states that the programs can be run in either BASIC or Extended BASIC. We found, however, that the program for *Keyboard Trainer* works only in Extended BASIC. The documentation is complete, but it is not easy to use. Teachers and parents will quickly tire of hunting through several paragraphs to find the program name for loading. There should be a fast and easy way for parents or teachers to change to a new program as soon as Wendy or Billy starts to get bored.

There are other features in both the documentation and the programs themselves that are unclear: In *Talking Typewriter* you can ERASE or change a word only while you are in the process of writing it. The instructions do not explain this. In *Fish and Count* it is the *fish* who must hook himself on the fishhook, rather than vice versa—an unexpected and somewhat illogical scenario.

The *order* of the directions in this program also seems backwards. When the question DO YOU WANT THE SPEECH OPTION TURNED ON? (Y/N) appears, the inclination is to respond to the prompt immediately. If

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you respond N you can continue, but if you answer Y you find out you must already have the Extended BASIC cartridge or the Speech Editor (as well as the Speech Synthesizer) plugged into the console. The on-screen directions remind you of this, but too late. Most of us will have already started running the program in BASIC and will then have to stop to take time to hunt up the necessary cartridge and reload the program. The first time this happens it may be just a minor inconvenience, but there are more than a few opportunities for this to happen again. Also, we could use some reminders, like, "Is your ALPHA LOCK key up?" No one enjoys fumbling around, wondering *why* the program isn't working.

Because of such "hard-to-figure" features, it is not likely that the children will be able to run these programs themselves (once they have been loaded in) until they have been through them with their teacher a few times. We also found that there are times when you have to hold the key down a long time in order to get the computer to respond. To answer the question, "Is it simple for the teacher to

use?" we would have to answer: Only for a patient soul who is willing to read lots of instructions. In answer to "Is it simple for the children to use" we say—Yes . . . with supervision.

Is It Worth the Money?

The package of eight programs, which comes with a three-ring binder of instructions, sells for \$154.65. Individual (tape or diskette) programs are also available at prices ranging from \$14.95 to \$29.95. A quick perusal of the educational software market reveals that there's not much to compare these with. I'll leave the judgment as to the value of these programs up to you. As for me, I feel them to be a little expensive.

Does It Use the Computer?

This software gets high marks in taking advantage of the computer's capabilities. All of the programs allow the option of using the Speech Synthesizer. *Fish and Count* lets students use the joystick to catch the fish they have counted. Most of the programs also make extensive use of

the computer's color graphics, animation and sound capabilities.

One of the most valuable aspects of Computer-Assisted Instruction is student-computer interaction. The computer's ability to *respond* to the student's work is probably its most valuable feature. These programs provide a wide variety of responses. While we would have liked a bit more positive reinforcement, students always know if they are right or wrong. The programs that incorporate the drills in-to game formats are especially effective.

Sweet Success

Most important, the content of these programs is designed to be simple enough for handicapped students to understand, challenging and varied enough to keep students from getting bored, and finally, easy enough that students can eventually master them. This last quality is a crucial one. The experience of *mastering* a drill or a game is a new one for many handicapped students, and we all know that *success* can do wonderful things for motivation, self-esteem, and performance.



Selected Programs From This Publication Are Now Available on Cassette Tape

- All purchasers of these packages are responsible for obtaining the individual documentation and program instructions in the indicated back issues of the magazine. When an issue goes out of print, copies of the program articles will be made available for purchase.
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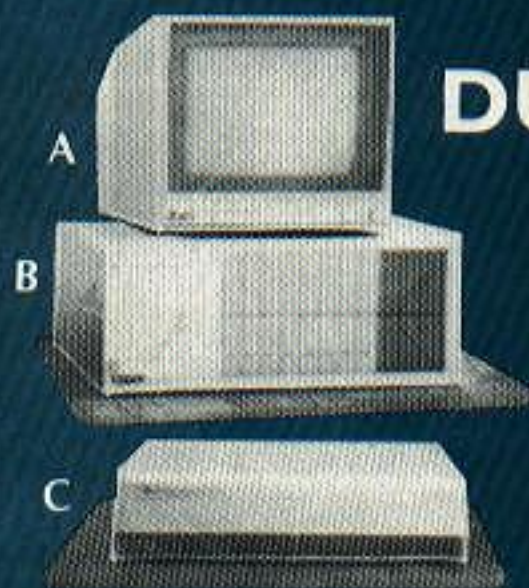
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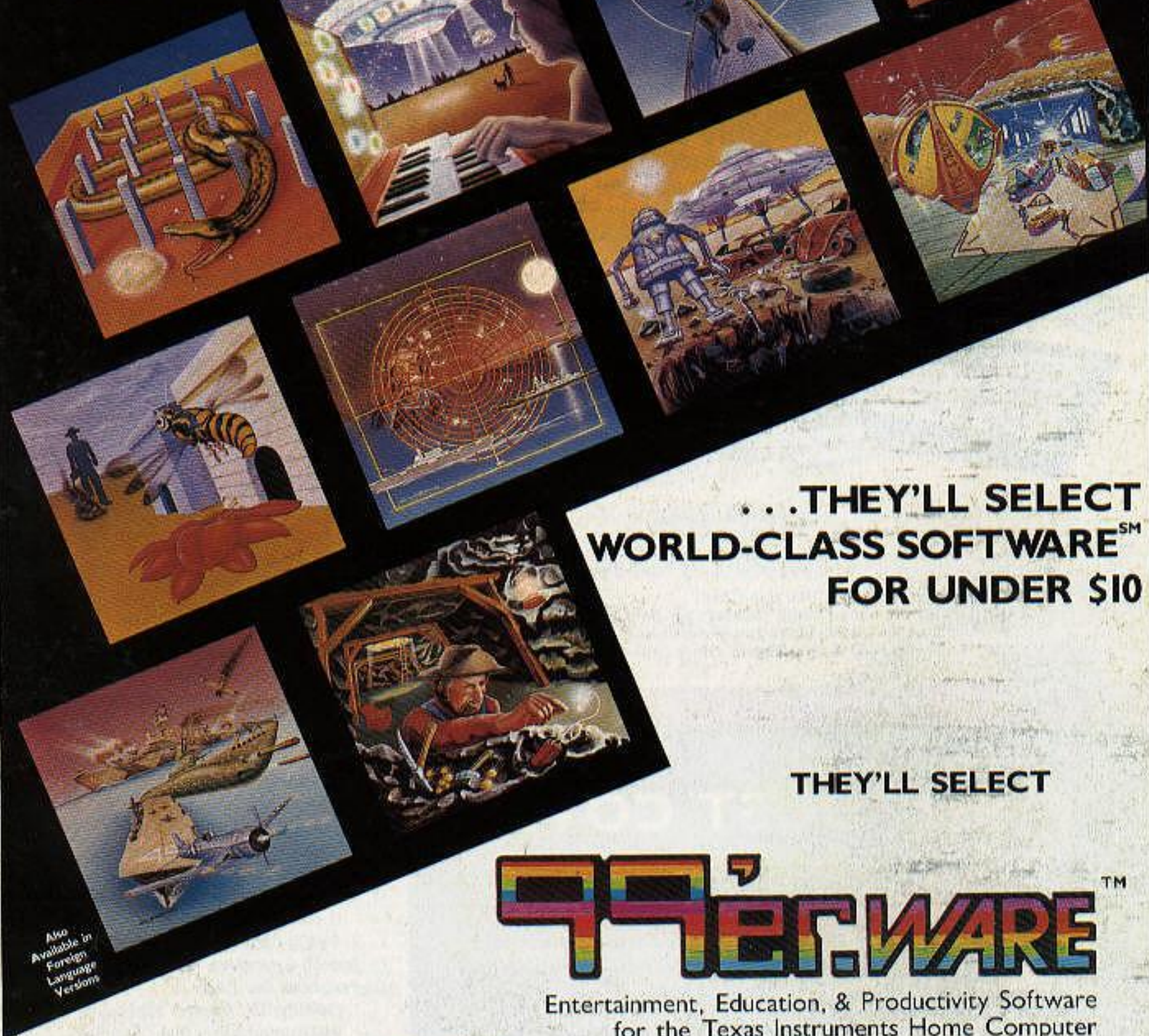
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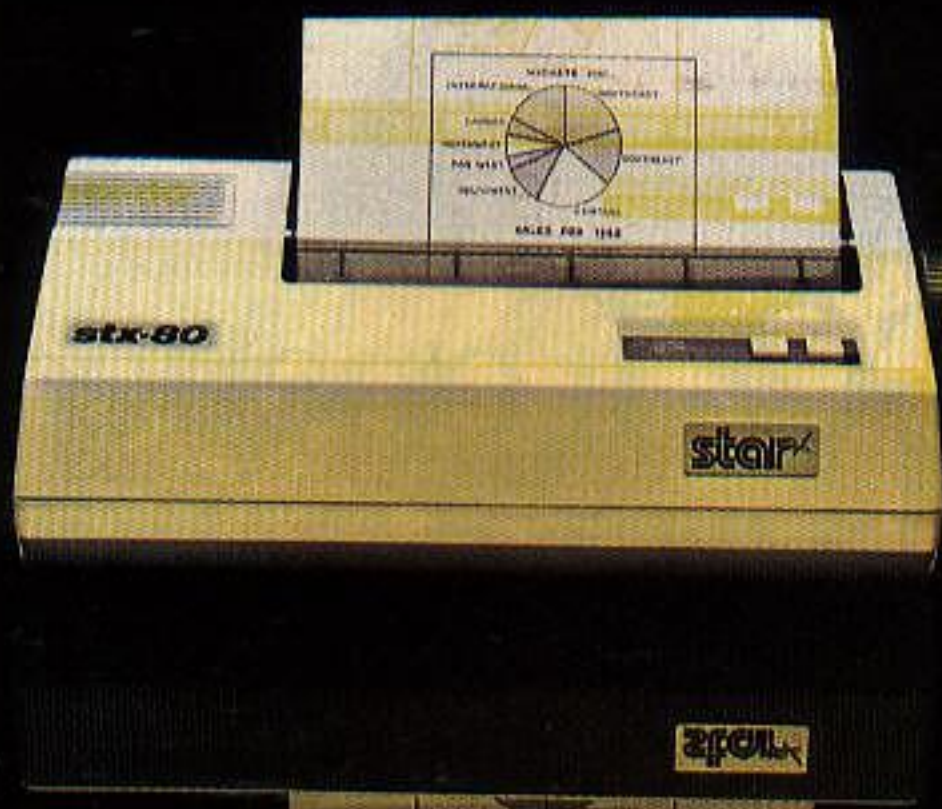
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"When they use it, they think they're teaching the machine. In reality, it's teaching them how to

learn. It definitely improves their attitude toward their other courses. Written and verbal expression improve—they're eager to show you, to tell you, what they've done."

Another teacher, Pete Rentof, adds, "What it fights is fear of failure—a mistake becomes a starting point. The whole learning process turns into a positive experience. It works."

The TI Learning Computer,

with TI LOGO and many other educational programs, is equipped to help open doors in any classroom. Including yours. For information on this remarkable system, contact: Texas Instruments Customer Relations, P.O. Box 53 Lubbock, Texas 79408.



TEXAS INSTRUMENTS

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